# TM 11-2330

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

# PROJECTION EQUIPMENT PH-132-C

*DEPARTMENT OF THE ARMY* • *JANUARY 1948*

TECHNICAL MANUAL

# PROJECTION EQUIPMENTS PH-132-C AND PH-132-D

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 8 June 1948

TM 11-2330, 22 January 1948, is changed as follows:

The title of the manual is changed to read:

PROJECTION EQUIPMENTS PH-132-C AND PH-132-D

# PART ONE
# INTRODUCTION

*Note* (Added). Projection Equipment PH-132-D is identical to Projection Equipment PH-132-C except that it is not equipped with a voltage selector switch. The information contained in this manual applies also to Projection Equipment PH-132-D except where specified otherwise in these changes.

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## 1. General

Projection Equipment PH-132-C * * * a roller screen. **Projection Equipment PH-132-C** is designed for operation on 115- or 230-volt alternating current (ac) or direct current (dc). **Projection Equipment PH-132-D is designed for operation only on 115-volt ac or dc.**

## 3. Table of Components (fig. 2)

* * * * * * *

*Note* (for PH-132-C only). In addition to * * * is 230 volts.

## 5. Projector (fig. 3)

The projector consists * * * can be mounted. **Projection Equipment PH-132-C has** four operating controls (a swivel-actuating knob, a rheostat knob, a power toggle ON-OFF switch and a toggle VOLTAGE switch), a power cord receptacle, another carrying handle, and two elevating-leg setscrews located on the lower front of the projector; **Projection Equipment PH-132-D is the same except that it does not have the toggle VOLTAGE switch.**

*Figure 3. Projector (part of Projection Equipment PH-132-C) with slide projection lens cone attached.*

## 22. Assembling Projector

* * * * * * *

*e.* CONNECTING POWER CORD. (Superseded.) Remove the power cord from the case. Throw the main switch (fig. 3) to OFF, and in addition, on Projection Equipment PH–132–C only, throw the voltage selector switch (fig. 3) to the proper position for the available power source. Connect the female connector to the male receptacle on the projector, and connect the male connector to the power source.

## 24. Projection of Opaque Material

*a.* PREOPERATION CHECKS.

* * * * * * *

(3) *Voltage Selector Switch* **(PH–132–C Only).** Check the position * * * available power supply.

* * * * * * *

## 25. Projection of Slides

*a.* PREOPERATION CHECKS.

* * * * * * *

(3) *Voltage Selector Switch* **(PH–132–C Only).** Check the position * * * available power supply.

* * * * * * *

## 26. Projection of Film Strips

*a.* PREOPERATION CHECKS.

* * * * * * *

(3) *Voltage Selector Switch* **(PH–132–C Only).** Check the position * * * available power supply.

* * * * * * *

## 28. Equipment Performance Check List

| | Item No. | Item | Action or condition | Normal indication | Corrective measure |
|---|---|---|---|---|---|
| PREPARATORY | * | * * | * * | * | * |
| | 4 | Voltage selector switch (PH–132–C only)------- | Throw to proper * * * of power source. | | |
| | * | * * | * * | * | * |

*Figure 17. Electrical system of Projection Equipment PH–132–C, schematic diagram.*

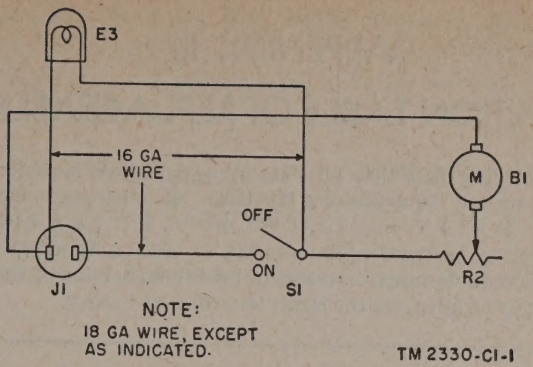


*Figure 17.1 (added). Electrical system of Projection Equipment PH–132–D, schematic diagram.*

## 49. Cooling System

The blower motor * * * ac or dc. The electrical system of **Projection Equipment PH–132–C** (fig. 17) includes a power resistor which can be switched into or out of the motor circuit by the voltage selector switch (fig. 3). When this resistance * * * ac or dc. **The electrical system of Projection Equipment PH–132–D (fig. 17.1) does not include a power resistor or a voltage selector switch.** The motor circuit **of Projection Equipment PH–132–C and PH–132–D** also includes a rheostat for controlling the speed of the motor. The blower is * * * light can escape.

## 50. Trouble Chart for Projection Equipment PH–132–C

* * * * * * *

## 50.1 Trouble Chart for Projection Equipment PH–132–D (Added)

| Trouble | Probable cause | Remedy |
|---|---|---|
| Lamp does not light | Main switch turned off | Turn switch to ON position. |
| | Main switch defective | Replace switch. |
| | Wiring defective | Repair or replace wiring. |
| | Lamp burned out | Replace lamp. |
| Motor does not operate | Motor brushes worn | Replace brushes. |
| | Rheostat defective | Replace rheostat. |
| Motor and lamp do not operate. | Switch or power connector broken. | Repair or replace. |
| Scratches or lines projected on screen. | Pressure glasses cracked or scratched. | Replace glasses. |
| | Film scratched | Replace film. |
| Pictures do not advance properly when projecting film strip. | Perforations broken | Replace film. |
| | Clutch knob loose | Tighten clutch knob. |

# APPENDIX III

# IDENTIFICATION TABLE OF REPLACEABLE PARTS

*Note* (Added). The fact that an item appears in this technical manual is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O & E, TA, T/BA, SIG 6, SIG 7 & 8, SIG 7–8–10, SIG 10, list of allowances of expendable material, or other authorized supply basis. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1 and 2.

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## 1. Supply Pamphlet for Projection Equipment PH–132–C

* * * * * * *

*Figure 20. Projection Equipment PH–132–C, electrical components.* **(The electrical components of Projection Equipment PH–132–D are the same except that resistor R–1 and switch S–2 are not included.)**

## 2.1 (Added.) Identification Table of Replaceable Parts for Projection Equipment PH–132–D

The replaceable parts for this equipment are the same as for Projection Equipment PH–132–C (par. 2 above) except that the following items are not used:

E–4, LAMP, incandescent: 230 v, 500 w.
R–1, RESISTOR, fixed: wire-wound; 200 ohms.
S–2, SWITCH, toggle: SPST; 5 amp.

[AG 300.7 (20 May 48)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:
EDWARD F. WITSELL
*Major General*
*The Adjutant General*

OMAR N. BRADLEY
*Chief of Staff, United States Army*

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For explanation of distribution formula see TM 38–405.

U. S. GOVERNMENT PRINTING OFFICE: 1948

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-2330

# PROJECTION EQUIPMENT PH-132-C


DEPARTMENT OF THE ARMY • JANUARY 1948

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 20 cents

DEPARTMENT OF THE ARMY
Washington 25, D. C., 22 January 1948

TM 11–2330, Projection Equipment PH–132–C, is published for the information and guidance of all concerned.

[AG 300.7 (8 Dec 47)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:
EDWARD F. WITSELL
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DWIGHT D. EISENHOWER
*Chief of Staff, United States Army*

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For explanation of distribution formula see TM 38–405.

# CONTENTS

# DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN— When ordered by your commander.

HOW—1. Smash—Use seldges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

## USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—All lenses, lamps, reflectors, mirrors, slides, and projector bodies.
2. Cut—Power cords.
3. Burn—All film strip, this manual, and all opaque materials.
4. Bend—All parts of projector body that are still recognizable.
5. Bury or scatter—All that remains.

## DESTROY EVERYTHING

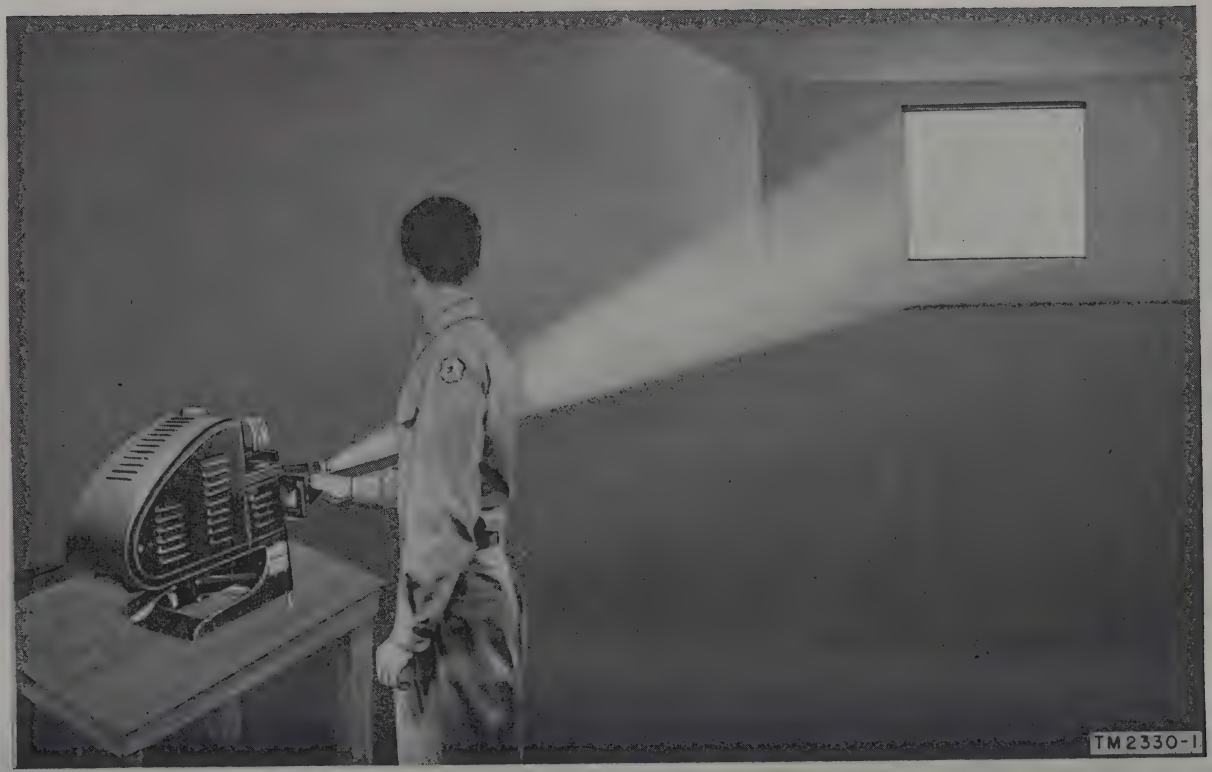


*Figure 1. Projection Equipment PH–132–C.*

# PART ONE

# INTRODUCTION

## Section I. DESCRIPTION OF PROJECTION EQUIPMENT PH-132-C

### 1. General

Projection Equipment PH–132–C is portable equipment for the projection of standard sized lantern slides, opaque copy, solid objects, or 35-millimeter (mm) film strips. It consists of two carrying cases: one containing a projector and certain accessories, and the other containing a roller screen. The equipment is designed for operation on 115- or 230-volt alternating current (ac) or direct current (dc).

### 2. Application

Projection Equipment PH–132–C is used as an aid in training, for briefing, and for providing entertainment. It may be operated in any average sized classroom.

### 3. Table of Components (fig. 2)

| Quan | Name of component | Dimensions (in.) | | | | Unit wt (lb) | Vol (cu ft) |
|---|---|---|---|---|---|---|---|
| | | h | wd | lg | diam | | |
| 1 | Case, containing<br>1 projector.<br>1 cone for 10″ lens.<br>1 film strip attachment.<br>1 slide carrier.<br>2 card carriers.<br>1 power cord.<br>1 lens, 18″ f/lg (focal length).<br>1 lens, 10″ f/lg.<br>1 lens, 4″ f/lg.<br>1 lamp, 115 volts, 500 watts.<br>1 pkg lens tissue.<br>1 set of running spares consisting of—<br>1 lamp 115 volts, 500 watts.<br>5 pkg lens tissue.<br>4 motor brushes. | 25 | 15 | 32 | | 82 | 7 |
| 1 | Bag, canvas, containing<br>1 screen. | | | 111 | 5 | 55 | 1.5 |

NOTE. In addition to the above items the equipment also may be furnished with two 230-volt, 500-watt lamps (1 running spare) for use where the available power supply is 230 volts.

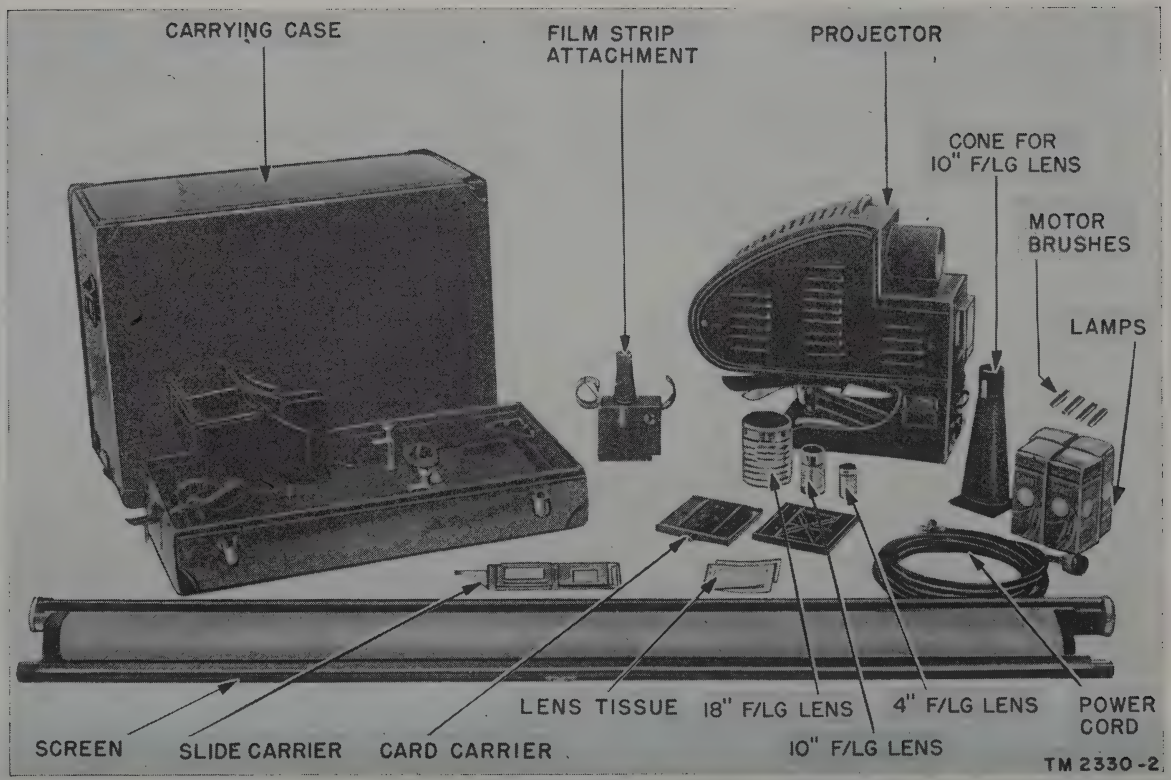


*Figure 2. Components of Projection Equipment PH–132–C.*

## 4. Projector Carrying Case (fig. 2)

The projector carrying case is made of hard vulcanized fiber, reinforced with steel edges and corners, and finished in olive drab color. The case consists of a shallow bottom section, and a deep top cover fastened with six latches. The cover has a carrying handle on each end. The bottom section contains a shock-mounted board provided with specially designed supports for the projector and accessories, and with rubber-cushioned compartments for the lenses.

## 5. Projector (fig. 3)

The projector consists of a steel housing welded to a steel base with the whole assembly painted with a black crackle finish. One side of the housing is fitted with two hinged doors (held closed by Dzus fasteners) which give access to the interior of the housing where a swivel-mounted lampholder and adjacent parabolic reflector, a first-surface mirror, three secondary mirrors, and a ventilating blower motor are contained. Ventilating louvers are provided on the sides and top of the housing, and a carrying handle is located on top of the housing. The bottom of the housing is provided with an opening normally closed by a spring-tensioned opaque copy holder (par. 6) mounted on the projector base. The upper front of the housing is provided with a lens sleeve (for the opaque copy lens), and a compartment containing a condenser lens assembly is hinged to the housing front just below the lens sleeve. The compartment is held closed by two slotted-head Dzus fasteners, and its front side is provided with stainless steel channels to receive a slide carrier (par. 9) and to provide a fastening on which the slide projection lens cone (par. 7), or the film strip attachment (par. 8), can be mounted. Four operating controls (a swivel-actuating knob, a rehostat knob, a power toggle ON-OFF switch and a toggle VOLTAGE switch), a power cord receptacle, another carrying handle, and two elevating-leg setscrews are located on the lower front of the projector.

## 6. Opaque Copy Holder (figs. 3 and 9)

The opaque copy holder is an assembly of arms, one end of which is pivoted to the projector base; the other end bears a flat tray which normally is held against the bottom of the projector by two springs pulling on the arms. The tray end of the assembly is equipped with an operating handle with latch, and is provided

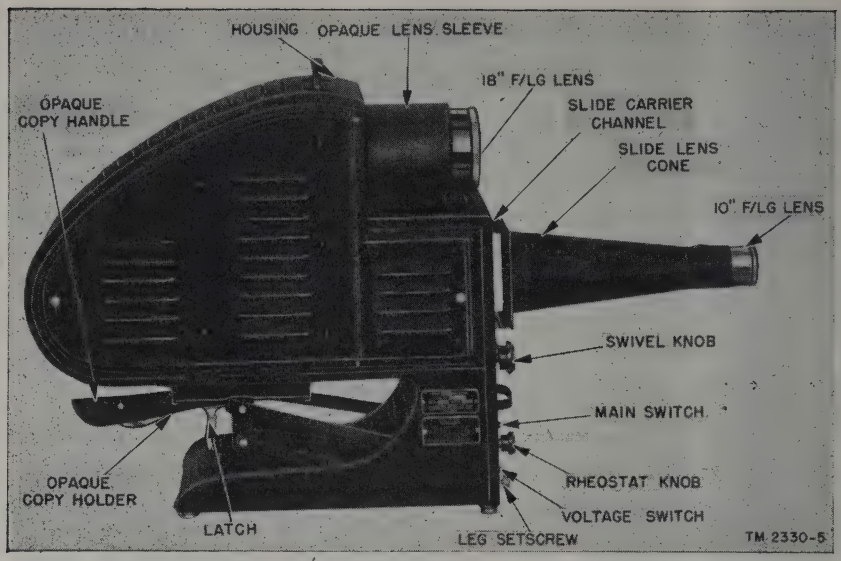


*Figure 3. Projector with slide projection lens cone attached.*

with a removable platen (fig. 11). The latch permits locking the tray away from the bottom of the projector.

## 7. Slide Projection Lens Cone (fig. 3)

The cone for the slide projection lens is aluminum and finished in black crackle enamel. The small end terminates in a cylindrical portion to receive the lens (par. 12). This end is equipped with a leaf spring and focusing ball to engage the spiral groove of the lens.

## 8. Film Strip Attachment (fig. 4)

The film strip attachment is an assembly consisting of a mounting plate, a body, a gate, film guides, and lens. The mounting plate is of stainless steel and is riveted to the body, which is finished in black crackle enamel. The upper and lower film guides are chrome plated and polished. The top of the body is hinged to provide access to the interior where the film movement mechanism and a condenser lens are contained (fig. 16). On the right side of the body is the film feed knob; on the left side is the framing clutch knob. A lense sleeve to receive the lens (par. 12) is welded to the front of the gate and is equipped with a leaf spring and focusing ball to engage the spiral groove of the lens.

## 9. Slide Carrier (fig. 2)

The slide carrier is made of brass, chrome plated and polished, except for the knob which is cast phenolic resin for thermal insulation. The carrier is provided with frames for two lantern slides, and is equipped with a latch to retain it in the channels on the projector.

## 10. Card Carrier (fig. 2)

The card carrier is a shallow box in which two movable plates are mounted, each having a groove on one edge. These plates are interconnected on the underside of the box by a linkage so that they remain parallel and move simultaneously. The carrier is made of steel parts, welded and riveted together, and finished in black enamel. Knobs are provided for moving the plates and for handling the carrier.

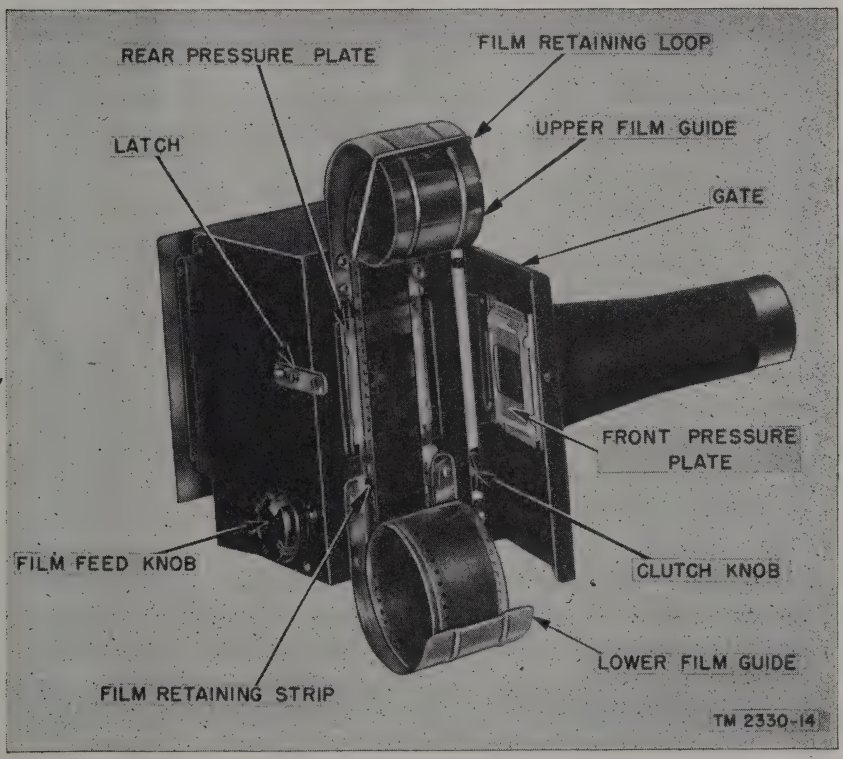


*Figure 4. Film strip attachment.*

### 11. Power Cord (fig. 2)

The power cord is a two-conductor cable, 15 feet long, terminated in a male connector at one end and in a female connector at the other end.

### 12. Lenses (fig. 2)

The projector is equipped with three lenses: a 4-inch diameter, 18-inch focal length lens for the projection of opaque copy; a 2-inch diameter, 10-inch focal length lens for the projection of standard lantern slides; and a 1½-inch diameter, 4-inch focal length lens for the projection of film strips. Each lens is fully covered with a fluoride low-reflectance coating, and is contained in a mount provided with a spiral focusing groove.

### 13. Screen (fig. 2)

The screen is made of two-ply fabric, 102 inches wide by 102 inches long, coated with vinyl resin which provides a white semi-matte reflecting surface. The fabric is wound on a spring-mounted roller contained in an aluminum housing 5 inches in diameter and 110 inches long. Brackets, with sliding, reversible hangers for fastening the screen to wall or ceiling, are provided near each end of the housing. A canvas carrying bag also is provided for the screen.

## Section II. INSTALLATION AND ASSEMBLY

### 14. Packaging Date

Projection Equipment PH–132–C is packed in two crates, one containing the projector and accessories case, and the other containing the screen.

*a.* EXPORT SHIPMENT. (1) *Projector.* The projector is disassembled and is placed in its carrying case with all accessories in their proper supports. The cover of the case is put in place and fastened. The case is placed within a close-fitting corrugated fiberboard box. An appropriate amount of desiccant is added before the box is sealed and inclosed within a heat-sealable moisture-vaporproof barrier. The moisture-vaporproof package is then inclosed within another corrugated fiberboard carton, which is wrapped in waterproof paper and placed in a nailed wooden shipping container.

(2) *Screen.* The screen is rolled up within its aluminum tube and placed in its carrying bag. It is then placed within a close-fitting corrugated fiberboard box and packed in the same manner as the projector ((1) above).

*b.* DOMESTIC SHIPMENT. Projection Equipment PH–132–C packed for domestic shipment may be received in shipping containers similar to those described for export shipment (*a* above) or in some other manner.

## 15. Unpacking

*Note.* The following information applies specifically to equipment packed for *oversea shipment.* The equipment packed for *domestic shipment* may be received in similar containers. Unpacking of domestic containers must be done just as carefully as described for oversea containers.

Be careful when unpacking Projector Equipment PH–132–C. Observe the following precautions:

*a.* Cut metal straps with a suitable cutting device or twist them with pliers until the straps crystallize and break.

*b.* Remove nails with a nail puller. *Prying may damage the equipment.*

*c.* Remove top, sides, etc., of the shipping container carefully. *Avoid thrusting crowbars or other tools deeply into the interior of any shipping container.*

*d.* Do not damage the packaging material any more than is absolutely necessary. Store the inside packaging materials in their respective shipping containers for re-use, with the exception of the bags of desiccant or dehydrating agent which may be either destroyed or returned to the depot for reactivation.

*e.* Open and unpack each container in accordance with the following step-by-step instructions:

(1) Cut metal straps.

(2) Remove nails and then remove top of shipping container.

(3) Lift out packaged equipment.

(4) Slit waterproof overwrap at seams and remove from package.

(5) Slit seal of outer carton and lift out moisture-vaporproofed package.

(6) Slit seam of moisture-vaporproof barrier and lift out inner carton.

(7) Slit seal of inner carton and open flaps.

(8) Lift out desiccant.

(9) Remove equipment carrying case.

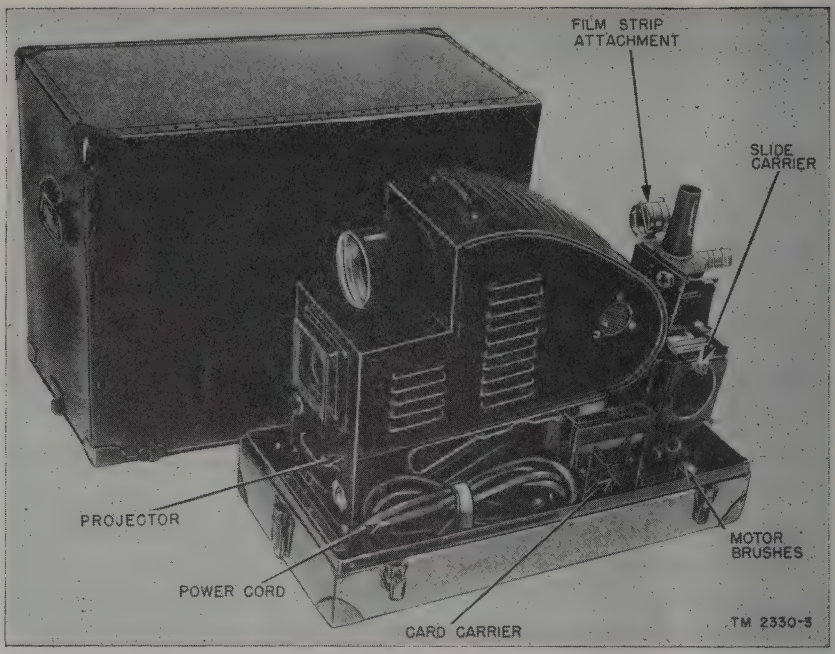


*Figure 5. Projector and accessories in case, front and left side.*

## 16. Checking

When the equipment is unpacked, open the case (par. 18*a*) and check all parts against the table of components (par. 3). If any parts are damaged or missing, refer to the identification table of replaceable parts (app. III) for requisitioning information.

## 17. Selecting Projection Room

Select a room which can be darkened. The darker the room, the better the projection will be. In the projection of opaque material, be sure that the room is *very* dark, as the light is directed toward the material and the projected image is obtained only by reflected light.

## 18. Removing Projector and Accessories from Carrying Case (figs. 5 and 6)

***Caution:*** Upon first removing the projector and accessories from the carrying case, note carefully the manner in which each component fits into its support so that it may be replaced in the same way and properly secured in place.

*a.* OPENING CASE. Release all latches. There are two on each long side and one on each end. Lift the cover straight up until it clears the projector. Each component is independently mounted on the board in the bottom of the case and, *with the exception of the lamps and lens tissue,* can be removed or replaced without disturbing other components.

***Caution:*** When unpacking, handle the equipment gently. Do not drop it. Do not touch the glass of the lenses or the surfaces of the mirrors with the fingers. Do not attempt to operate any part of the equipment until this manual has been read thoroughly.

*b.* REMOVING PROJECTOR. The projector is clamped at one end of the case. Slip the end of the springs off the wingnuts. Loosen the wingnuts (the studs are staked to prevent the removal of the nuts). Lift each clamp and turn it so that it is disengaged from the base of the projector. Lift the projector from its saddle.

*c.* REMOVING FILM STRIP ATTACHMENT. The film strip attachment is held on the top of the elevated support at one end of the case. Depress the spring and slide the film attachment horizontally out of the channels in which it is mounted.

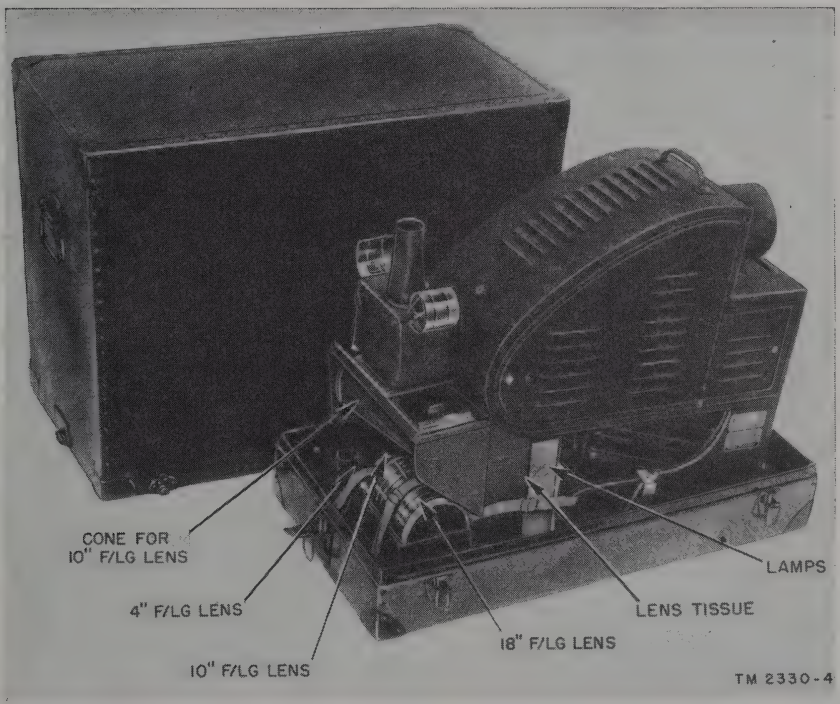


*Figure 6. Projector and accessories in case, rear and right side.*

*d.* REMOVING SLIDE CARRIER. The slide carrier is contained in a special compartment near the top of the elevated support. A spring latch retains the slide carrier in position. Depress this latch and slide the carrier horizontally out of the channels.

*e.* REMOVING CARD CARRIERS. The card carriers are contained in a special compartment located at the left side of the projector case and are retained in position by a vertical spring clip. Move the spring clip laterally and lift out the card carriers.

*f.* REMOVING POWER CORD. The power supply cord is strapped to a bracket at the left side of the case. Loosen the strap until the end is close to the buckle and remove the power cord.

*g.* REMOVING LENSES. The three lenses are strapped into rubber-padded compartments at the rear of the carrying case. Loosen the straps and remove the lenses.

*h.* REMOVING LENS CONE. The lens cone for the 10-inch lens is contained in the elevated support. It is held in a channel by a spring clip, with the small end of the cone supported on a ledge. Push the clip to the left and slide the cone out of the mounting channel.

*i.* REMOVING LAMPS AND LENS TISSUE. The lamps and lens tissue are packed beneath the projector and strapped against the wall of the saddle on which the projector is supported. First, remove the projector (*b* above) ; then loosen the straps and remove the lamps and/or lens tissue.

*j.* REMOVING SPARE MOTOR BRUSHES. The spare motor brushes are in a Bakelite container located in the left side of the case. Unscrew the cap of the container to remove the brushes. The bottom of the container is fastened to the board.

## 19. Removing Screen from Carrying Bag

Unbuckle the strap and open the flap at the end of the bag. Withdraw the screen from the bag.

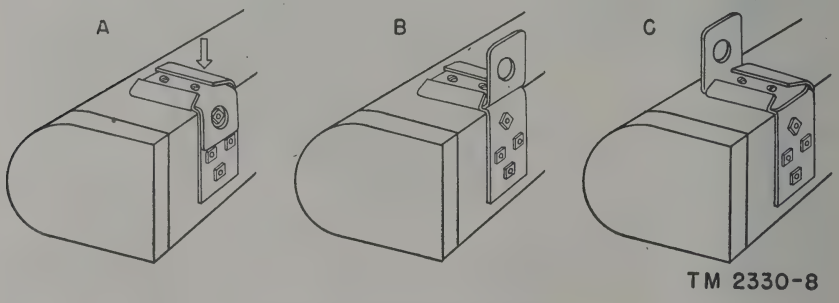


*Figure 7. Mounting screen.*

## 20. Mounting Screen (fig. 7)

When the screen is withdrawn from its bag, the bracket hangers are in the position shown at A in figure 7. Remove the retaining screws and slide the hangers out of the bracket channels. To mount the screen on a wall, insert the hangers into the brackets in the position shown at B in figure 7; to suspend the screen from the ceiling, insert the hangers in the position shown at C in figure 7. In either case, replace the screws to hold the hangers in the selected position.

## 21. Locating Projector

Remove the projector from its case (par. 18*a* and *b*) and place on a table at approximately 25 to 30 feet from the screen. Use a table high enough so that the projected light will pass over the heads of the audience.

## 22. Assembling Projector

*a.* INSTALLING LAMP. Open the large door of the projector by turning the latch counterclockwise. The lampholder will be in either one of the positions shown in figures 8 and 12. If the lampholder is in the position shown in figure 12, turn the swivel actuating knob clockwise as far as it will go. The socket will then be in position for inserting the lamp (fig. 8). The base of the lamp has two ears, one wider than the other, to correspond with the two slots in the lampholder. Be sure that the wider ear is inserted into the wider slot of the socket. Push the lamp gently downward until the ears are below the rim of the socket. Turn the lamp clockwise until it comes to a positive stop.

***Caution:*** Be sure that the rated voltage of the lamp corresponds with the voltage of the available power source.

*b.* INSERTING OPAQUE COPY LENS. Remove the lens (4-inch diam.) from the compartment in the carrying case. One end of the lens is knurled. Insert the opposite end of the lens into the opaque copy lens sleeve (fig. 3) and push it in slowly. A spring-loaded ball will engage the spiral focusing groove.

*c.* ATTACHING CONE AND LENS FOR SLIDE PROJECTION. The base of the lens cone is provided with a square mounting plate. To mount the cone, slide the mounting plate into the channels provided on the front of the condenser compartment (fig. 13), making sure that the spring on the small end is on top. Slide the cone all the

way down the channels until the bottom edge of its mounting plate rests on the horizontal flange. Insert the lens (2-inch diam.) in the same manner as for the opaque copy lens (*b* above).

*d.* Mounting Film Strip Attachment. The mounting plate of the film strip attachment is square, and may be inserted in the mounting channels in either one of two positions. For pictures having the long dimension horizontal, insert the attachment with the closed film loop on top. For pictures with the long dimension vertical, insert the film attachment with the closed film loop to the left side of the projector. Slide the attachment all the way down the channels until the bottom edge of its mounting plate rests on the horizontal flange. Insert the lens (1½-inch diam.) in the same manner as for the opaque copy lens (*b* above).

*e.* Connecting Power Cord. Remove the power cord from the case. Throw the main switch (fig. 3) to OFF, and the voltage selector switch (fig. 3) to the proper position for the available power source. Connect the female connector to the male receptacle on the projector, and the male connector to either a 115-volt or 230-volt a-c or d-c power source.

## 23. Repacking

Remove all attachments from the projector and replace the projector and accessories in the carrying case, reversing the order given in paragraph 18. Roll up the screen, put the hangers in the position shown at A in figure 7, and replace the screen in its carrying bag.

# PART TWO

# OPERATING INSTRUCTIONS

*Note.* For information on destroying this equipment to prevent enemy use, see the destruction notice at the front of the manual.

## Section III. STEP-BY-STEP OPERATING PROCEDURES

### 24. Projection of Opaque Material

*a.* PREOPERATION CHECKS. (1) *Projector.* Check to see that the projector has been properly assembled for the projection of opaque material (par. 22*a*, *b*, and *e*).

(2) *Lamp.* (*a*) Check the lamp to make sure that its rated voltage corresponds with the available power supply. If necessary remove the lamp from the projector and replace it with the proper lamp (par. 22*a*).

(*b*) Check the position of the lamp. If the lamp is in the position shown in figure 8, it is in the correct position for the projection of opaque material. If the lamp is in the position shown in figure 12, turn the swivel actuating knob clockwise as far as it will go. This will place the lamp in the proper position for the projection of opaque material (fig. 8).

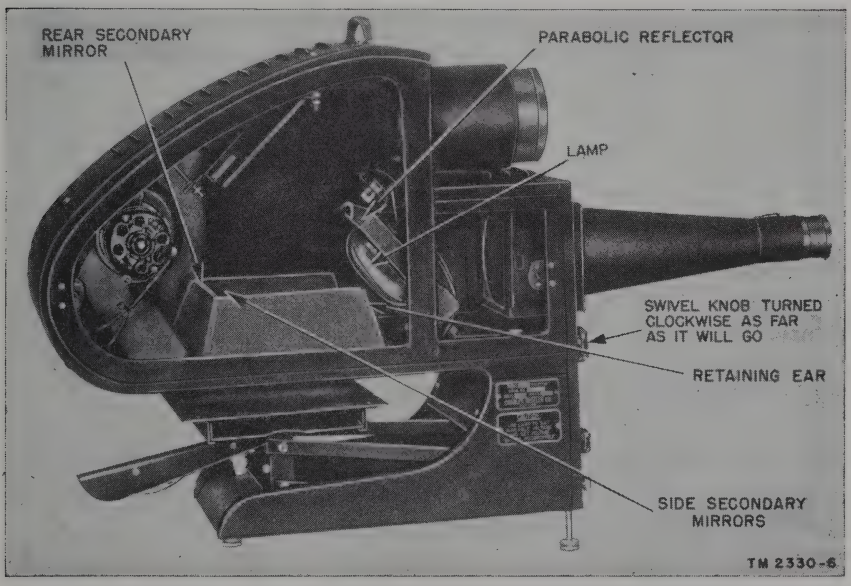


*Figure 8. Position of lamp for projection of opaque material.*

(3) *Voltage selector switch.* Check the position of the voltage selector switch (fig. 3) to make sure that it is properly set for the available power supply.

*b.* PREOPERATION PROCEDURE. (1) Cleaning optical elements. (*a*) Clean the external surfaces of the opaque copy projection lens (par. 32).

(*b*) Examine the first-surface mirror (fig. 18) and, if necessary, clean it (par. 34).

***Caution:*** The surface of the first-surface mirror is extremely delicate. Do not touch it with the fingers. Do not clean it unnecessarily.

(*c*) Examine the surfaces of the rear and side secondary mirrors (fig. 8) and, if necessary, clean them (par. 35).

(*d*) Clean the parabolic reflector (par. 36).

(*e*) Clean the lamp (par. 37).

(2) *Centering image on screen.* Following the procedure outlined in *c* below, lower the platen and insert a sample of the material to be projected. Throw the main switch to ON. Proceed as follows:

(*a*) *Lateral adjustment.* Move the projector on the projection table so that the front and back center lines are perpendicular to the screen on a plane approximately parallel with the floor.

(b) Vertical adjustment. Loosen the elevating leg screws (fig. 3). Grasp the front handle of the projector and lift the front of the projector until the screen image is suitably centered. Extend the elevating legs as required and tighten the setscrews.

*Note.* Do not elevate the front of the projector more than 7°. Place the projector on a table high enough so that the optical axis of the projector is within 7° of the horizontal plane.

(3) *Focusing.* Push or pull the lens until the screen image is in approximate focus. Then rotate the lens in the lens sleeve until a sharp image is obtained on the screen.

(4) *Rheostat.* Adjust the rheostat to an intermediate position, so that the blower is operating with a minimum of noise. If the projector is being operated in an extremely hot room, increase the speed of the blower accordingly. Throw the main switch to OFF.

*c.* OPERATION OF OPAQUE COPYHOLDER (fig. 9). Face the doors of the projector and place the left hand on the handle, with the thumb on the trigger. Depress the trigger with the thumb and lower the copyholder. The latch will enter a rectangular hole in the cross brace of the projector base. To lock the copyholder in the open position, remove the thumb from the trigger, permitting the teeth on the latch to engage with the cross brace. To return

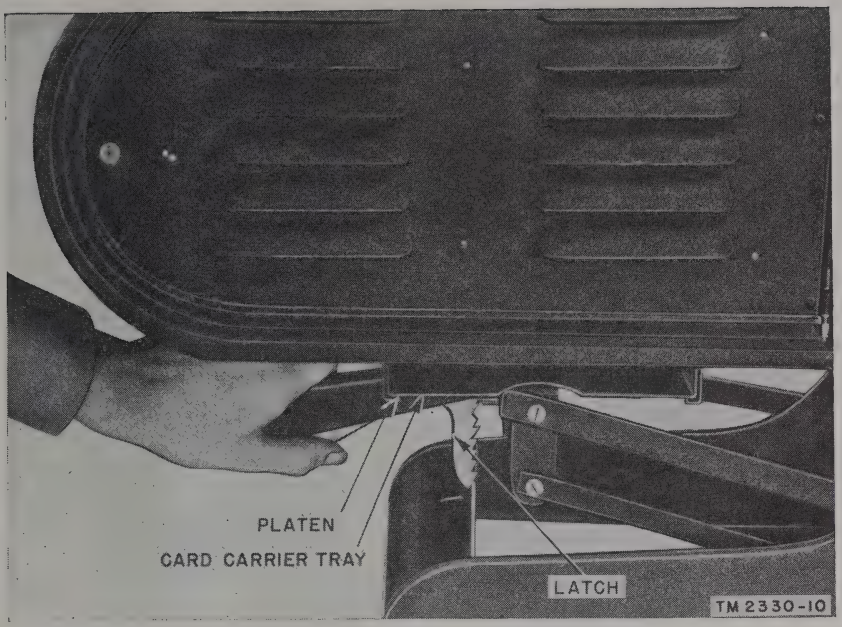


*Figure 9. Operation of opaque copy holder.*

the copyholder to the operating position, depress the trigger and allow the springs to pull the copyholder *slowly* to the closed position. *Do not let the copyholder fly upward to strike the bottom of the projector.*

*d.* PROJECTION OF BOUND PAGES OR LOOSE PAPERS. The opening for the projection of opaque copy is 6¼ inches by 6¼ inches. Any 6¼-inch square portion of a sheet having a vertical dimension less than 11½ inches can be projected.

(1) *Bound pages.* Lower the opaque copy holder (*c* above). Place the copy on the platen with the bottom edge of the copy toward the screen (fig. 10). The copyholder may be returned to the closed position or retained in the open position. Throw the main switch to ON.

(2) *Loose papers.* If the loose papers to be projected are smaller than 7 inches square, paste them to cardboard larger than 7 inches square. Lower the opaque copy holder (*c* above). Place the copy on the platen with the bottom edge of the copy toward the screen. Return the copyholder to the closed position. Throw the main switch to ON.

*e.* PROJECTION OF CARDS. Projection Equipment PH–132–C is furnished with two card carriers (par. 10). These are adjustable to accommodate cards from 3 inches by 3 inches to 6 inches by

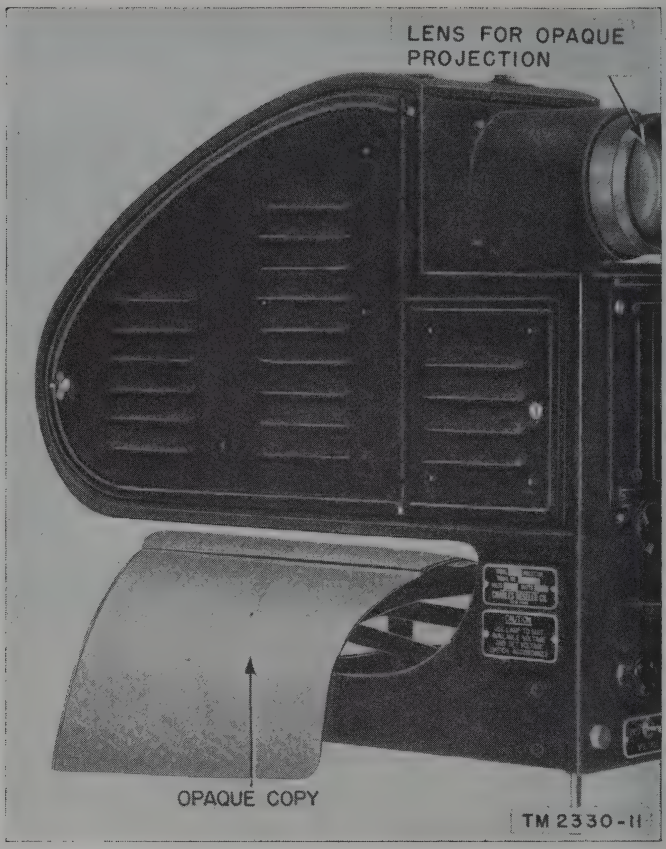


*Figure 10. Projection of bound pages.*

6 inches. To mount a card, place it on the grooved plates on top of the card carrier. Adjust the plates by moving the knobs on the bottom of the carrier until the card fits into the grooves. Lower the opaque copy holder and lock it in the open position (*c* above). Slide the platen off the copyholder, exposing the card carrier tray (fig. 11). Release the latch and let the copyholder rise until the card carrier tray is in contact with the bottom of the projector housing. Insert the card carrier into the tray with the bottom edge of the copy toward the screen. Throw the main switch to ON. The card carrier may be removed by pushing it through to the other side of the projector with the second carrier, or by grasping it by the knob and sliding it out.

*f.* USE OF POINTER. A pointer may be used in the projection of opaque material to aid in classroom instruction. If a pointer is to be used, the projector is operated with the opaque copy holder

locked in the open position (*c* above). Insert a pencil or similar pointed instrument and point out the desired details of the subject. The screen image will show the opaque material and the pointer.

*g.* SHUTTING DOWN PROJECTOR. Throw the main switch to OFF. If the card carrier has been used, lower the copyholder and lock it in the open position (*c* above). Remove the card carrier from the tray. Slide the platen into place over the card carrier tray. Release the latch and let the copyholder rise to the closed position. Retract the elevating legs. Disassemble the projector and replace it in the carrying case (par. 23).

## 25. Projection of Slides

*a.* PREOPERATION CHECKS. (1) *Projector.* Check to see that the projector has been properly assembled for the projection of slides (par. 22*a*, *b*, *c*, and *e*).

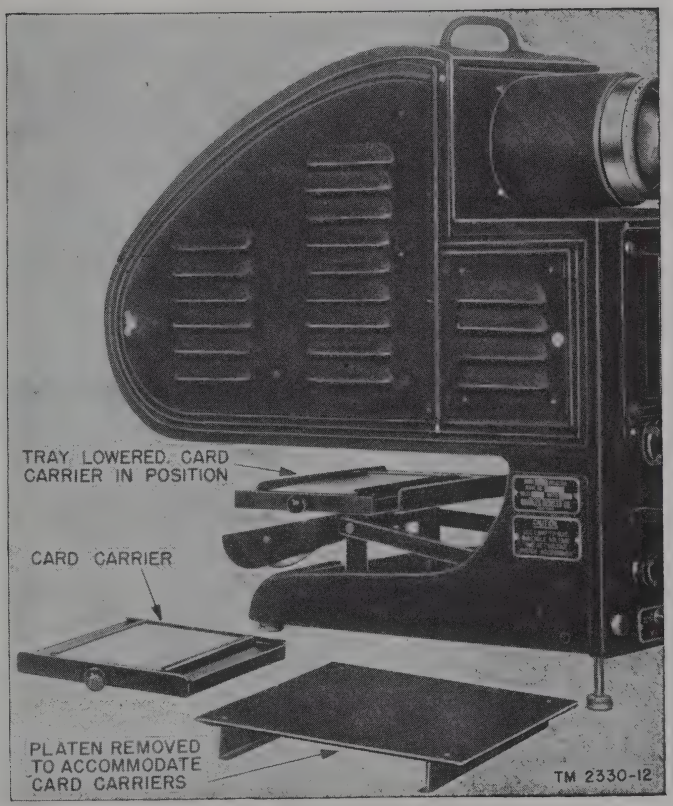


*Figure 11. Projection of cards.*

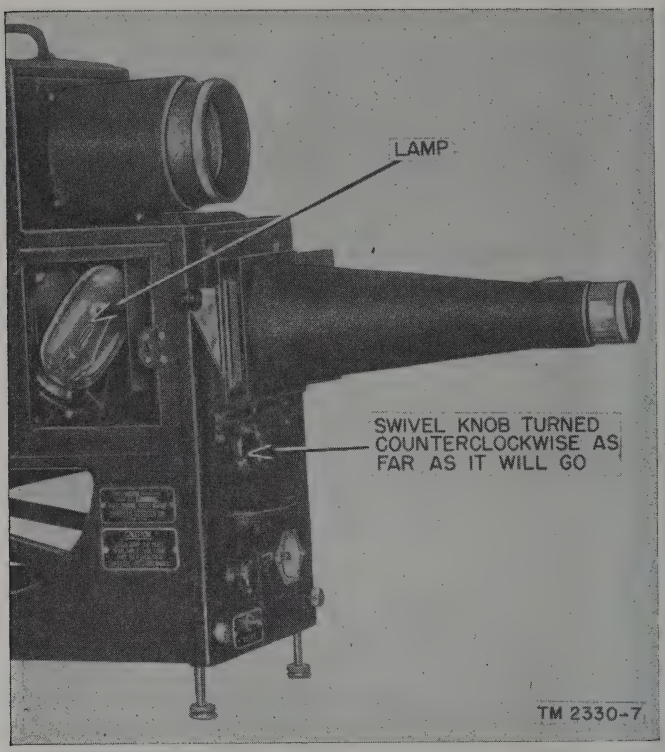


*Figure 12. Position of lamp for projection of slides and film strips.*

(2) *Lamp.* (*a*) Check the lamp to make sure that its rated voltage corresponds with the available power supply. If necessary, remove the lamp and replace it with the proper lamp (par. 22*a*).

(*b*) Check the position of the lamp. If it is in the position shown in figure 8, turn the swivel actuating knob counterclockwise as far as it will go. This will place the lamp in the proper operating position for the projection of slides (fig. 12).

(3) *Voltage selector switch.* Check the position of the voltage selector switch to make sure that it is properly set for the available power supply.

*b.* PREOPERATION PROCEDURE. (1) *Cleaning optical elements.* (*a*) Clean the external surfaces of the lens (par. 32).

(*b*) Clean all condensers and the heat-absorbing glass (par. 33).

(*c*) Clean the parabolic reflector (par. 36).

(*d*) Clean the lamp (par. 37).

(2) *Centering image on screen.* Following the procedure outlined in *c* below, insert the slide carrier into the channels provided on the projector. Throw the main switch to ON, and make the

lateral and vertical adjustments described in paragraph 24*b*(2) (*a*) and (*b*).

(3) *Focusing.* Focus the slide projection lens in the same manner as described in paragraph 24*b*(3).

(4) *Rheostat.* Adjust the rheostat in the same manner as described in paragraph 24*b*(4). Then throw the main switch to OFF.

*c.* Operating Slides. (1) Insert the slide carrier into the slide carrier channels (fig. 13) and push it in as far as it will go.

(2) Arrange the slides in the desired projection sequence.

(3) Pull the slide carrier to the extreme right. Insert the first slide into the right-hand pocket of the slide carrier. Push the slide carrier to the left as far as it will go. The first slide is now in projection position. Throw the main switch to ON.

*Note.* Many slides have a small dot or circle on one corner of the mask. If the slide is inserted into the carrier so that this dot or circle is in the upper, right-hand, rear corner, the slide will be correctly placed for projection. If, when handling the slide, the thumb is placed upon this dot, or circle, finger marks on the slides will be avoided.

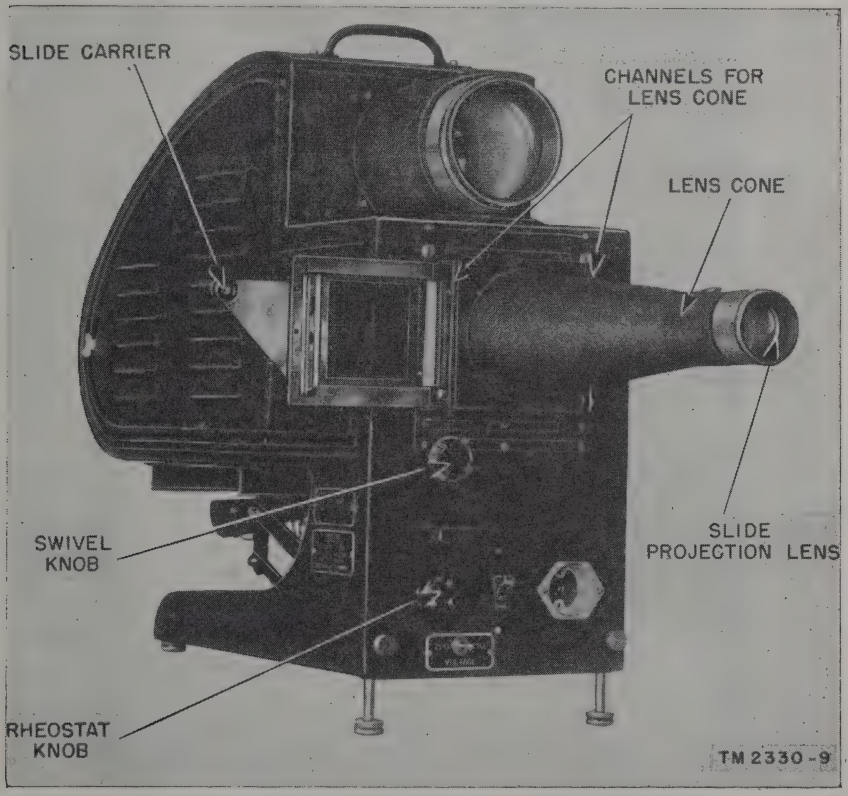


*Figure 13. Projector assembled for projection of slides.*

(4) While slide No. 1 is in the projection position, insert the second slide in the left-hand pocket of the slide carrier on the other side of the projector. Draw the slide carrier to the right as far as it will go. This will place the second slide in projection position. Remove the first slide from the right-hand pocket and insert the next slide. Continue this procedure until all the slides have been projected.

*d.* SHUTTING DOWN PROJECTOR. Throw the main switch to OFF. Push down on the slide carrier handle until the latch at the opposite end is raised sufficiently to permit the slide carrier to be pulled out of the channels. Retract the elevating legs. Disassemble the projector and replace it in the carrying case (par. 23).

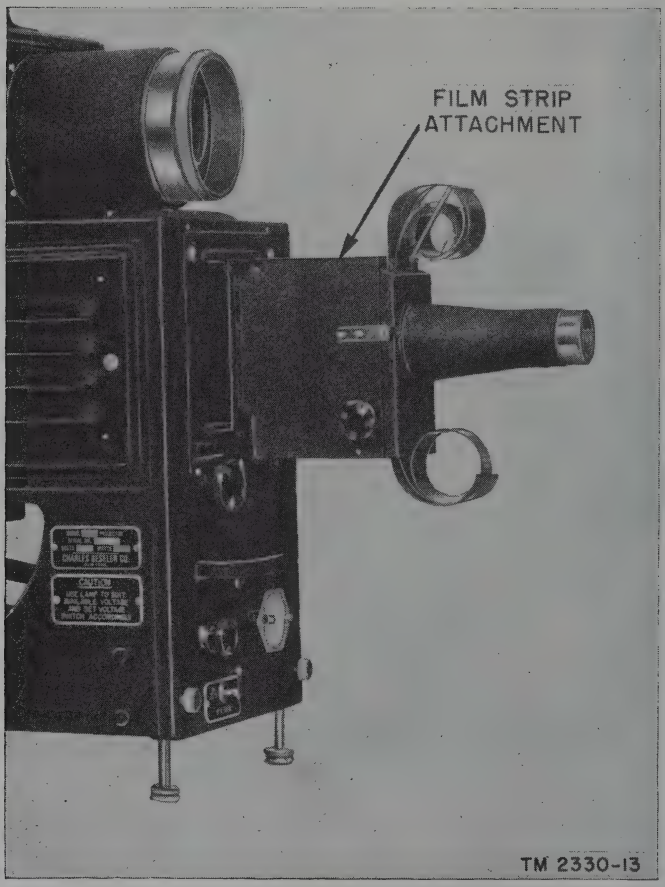


*Figure 14. Projector assembled for projection of film strips.*

## 26. Projection of Film Strips

*a.* PREOPERATION CHECKS. (1) *Projector.* Check to see that the projector has been properly assembled for the projection of film strips (par. 22*a, b, d,* and *e*).

(2) *Lamp.* (*a*) Check the lamp to make sure that its rated voltage corresponds with the available power supply. If necessary, remove the lamp and replace it with the proper lamp (par. 22*a*).

(*b*) Check the position of the lamp. It should be in the same position as for the projection of slides (par. 25*a*(2) (*b*).

(3) *Voltage selector switch.* Check the position of the voltage selector switch to make sure that it is properly set for the available power supply.

*b.* PREOPERATION PROCEDURE. (1) *Cleaning optical elements.* (*a*) Clean the external surfaces of the film strip attachment projection lens (par. 32).

(*b*) Clean all condensers and heat-absorbing glass (par. 33).

(*c*) Clean the parabolic reflector (par. 36).

(*d*) Clean the lamp (par. 37).

(*e*) Clean the front and rear pressure glasses (pars. 39 and 40).

(*f*) Clean the condenser in the film attachment (par. 38).

(2) *Centering image on screen.* Following the procedure outlined in *c* below, thread a film strip in the film strip attachment. Throw the main switch to ON, and make the lateral and vertical adjustments described in paragraph 24*b*(2) (*a*) and (*b*).

(3) *Focusing.* Adjust the film strip projection lens in the same manner as described in paragraph 24*b*(3).

(4) *Rheostat.* Adjust the rheostat in the same manner as described in paragraph 24*b*(4). Then throw the main switch to OFF.

*c.* THREADING FILM (fig. 4). Open the film gate by releasing the spring latch and then swing open the gate. Pull down the film retaining loop so that the upper film pocket is open. Insert a roll of film in the film pocket so that the free end feeds off the top of the roll toward the projector. Insert the free end of the film beneath the film guide strips so that one or two perforations become engaged with the sprocket teeth. Turn the film feed knob clockwise. The film will automatically feed through the attachment. Swing the film gate closed and latch it. Throw the main switch to ON.

***Caution:*** While threading the film, take care not to scratch or otherwise mar the pressure glasses.

*d.* FRAMING. Hold the film feed knob (fig. 4) firmly and unscrew the clutch knob slightly. Turn the film feed knob until the picture is properly framed. Then tighten the clutch knob. Each successive one-fourth turn of the film feed knob clockwise will advance the film so that the next picture will be properly framed for projection.

*e.* SHUTTING DOWN PROJECTOR. Throw the main switch to OFF. Remove the roll of film from the lower film guide. Retract the elevating legs. Disassemble the projector and replace in carrying case (par. 23).

## Section IV. EQUIPMENT PERFORMANCE CHECKLIST

### 27. Purpose and Use of Checklist

*a.* GENERAL. The equipment performance checklist (par. 28) will help the operator to determine whether Projection Equipment PH–132–C is functioning properly. The checklist gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures that the operator can take. Items 1 through 9 are checked before starting; items 10 and 11, during operation; and items 12 through 14, when stopping.

*b.* ACTION OR CONDITION. The information given under the *action or condition* column represents, in the case of some items, the control settings at which the item is to be checked. In other items, it represents an action that must be taken in order to check the normal indication given in the column bearing the title *normal indication.*

*c.* NORMAL INDICATION. The normal indications listed include the visible and audible signs that the operator will perceive when he checks the items. If the indications in equipment operation are not normal, the operator should apply the recommended corrective measures.

*d.* CORRECTIVE MEASURES. The corrective measures listed are those that the operator can make without turning the equipment in for repairs. A paragraph reference indicates that the correction of the trouble cannot be effected during operation and that trouble shooting by an experienced repairman is called for. If the equipment will not operate, or if the recommended corrective measures do not yield results, trouble shooting is necessary. If the situation requires that operation be continued, however, and if the equipment is not completely inoperative, the operator may be required to keep the equipment in operation as long as it is possible to do so.

## 28. Equipment Performance Checklist

| | Item No. | Item | Action or condition | Normal indication | Corrective measure |
|---|---|---|---|---|---|
| PREPARATORY | 1 | Main switch | Throw to OFF. | | |
| | 2 | Power cord | Connect to power source and to projector receptacle. | | |
| | 3 | Lampholder | Install lamp of proper voltage for power source. | | |
| | 4 | Voltage selector switch | Throw to proper designation of voltage of power source. | | |
| | 5 | Lamp | Throw main switch to ON. | Lamp burns steadily with maximum brightness. | Replace lamp with one of proper rated voltage. |
| | 6 | Elevating legs | Extend as required | Projected light centered on screen. | Reset elevating legs. |
| | 7 | Rheostat | Turn knob to intermediate position. | Suitable blower speed with minimum objectionable noise. | Adjust rheostat. |
| | 8 | Type of projection: | | | |
| | | *a.* Opaque copy | (1) Turn swivel knob all the way clockwise. | Light shines through opaque copy lens sleeve. | |
| | | | (2) Lower copyholder | Copyholder held in lowered position by latch. | Adjust latch to retain holder. |
| | | | (3) (Cards only.) Remove platen from copyholder. | Card tray exposed. | |
| | | | (4) (Cards only.) Insert cards in card carrier. | | |
| | | | (5) Put sample copy on platen or insert card carrier in tray. | | |
| | | | (6) Insert 4-inch diameter lens in lens sleeve and focus lens. | Sharp image appears on screen. | Refocus lens. |

| | Item No. | Item | Action or condition | Normal indication | Corrective measure |
|---|---|---|---|---|---|
| PREPARATORY | | *b.* Slides | (1) Put lens cone in position. | | |
| | | | (2) Turn swivel knob all the way counterclockwise. | Light shines through lens cone. | |
| | | | (3) Put slide carrier in place. | Right-hand pocket of carrier available for first slide. | Pull carrier to the right. |
| | | | (4) Insert 2-inch diameter lens in lens cone. | | |
| | | | (5) Insert first slide in right-hand pocket of carrier and push carrier all the way to the left. | | |
| | | | (6) Focus lens | Sharp image of first slide appears on screen. | Refocus lens. |
| | | | (7) Insert second slide in left-hand pocket of carrier. | | |
| | | c. Film strip | (1) Put film strip attachment in place. | | |
| | | | (2) Turn swivel knob all the way counterclockwise. | Light shines through film attachment lens sleeve. | |
| | | | (3) Thread film through film gate. | | |
| | | | (4) Insert 1½-inch diameter lens in lens sleeve and focus the lens. | Sharp image of film strip appears on screen. | Refocus lens. |
| | | | (5) Frame picture | Whole picture appears on screen. | Reframe. |
| | 9 | Main switch | Throw to OFF | Light goes out and blower stops. | Disconnect power cord and refer to par. 50. |

| | | | | | |
|---|---|---|---|---|---|
| OPERATION | 10 | Main switch | Throw to ON | Light appears on screen and blower starts. | Check power cord. |
| | 11 | Type of projection: | | | |
| | | *a.* Opaque copy | (1) Put copy in place | Image appears on screen. | |
| | | | (2) (Optional.) Raise copy holder to closed position. | | |
| | | *b.* Slides | (1) Leave carrier all the way over to the left to show first slide. | Image of first slide appears on screen. | |
| | | | (2) Pull carrier to the right to show second slide. | Image of second slide appears on screen. | |
| | | | (3) Remove first slide and replace with another. | | |
| | | | (4) Push carrier to the left to show third slide, and so on. | Image of third slide appears on screen. | |
| | | *c.* Film script | Turn film feed knob ¼ turn clockwise to show each frame. | Image of film appears on screen. | |
| STOP | 12 | Rheostat | Turn all the way counterclockwise. | Blower speed reduces to minimum. | |
| | 13 | Main switch | Throw to OFF | Light goes out and blower stops. | |
| | 14 | Power cord | Disconnect from power source. | | |

# PART THREE

# MAINTENANCE INSTRUCTIONS

## Section V. PREVENTIVE MAINTENANCE TECHNIQUES

### 29. Meaning and Importance of Preventive Maintenance

*a.* MEANING. Preventive maintenance (PM) means making systematic checks and adjustments at regular intervals to keep equipment operating at top efficiency.

*b.* IMPORTANCE. PM is of utmost importance. The usefulness of this projection equipment depends upon its being ready to operate at peak efficiency when needed. It is vitally important that operators and repairmen of this equipment maintain it properly. PM for Projection Equipment PH–132–C consists of inspecting and cleaning the optical elements of the equipment.

### 30. Frequency of Maintenance

Inspect the optical elements prior to each use of the projector and clean them if necessary. *Do not clean the first-surface mirror unless absolutely necessary* (par. 34).

## Section VI. ITEMIZED PREVENTIVE MAINTENANCE

### 31. Preventive Maintenance Tools and Materials

PM of Projection Equipment PH–132–C requires the following tools and materials:

Screw driver.
Camel's-hair brush.
Syringe bulb.
Lens tissue.
Soft, lint-free cloth.

### 32. Cleaning Projection Lenses

Remove any dust with a camel's-hair brush, or by blowing air across the surface with a syringe bulb. Do not breathe on the lens. After all dust has been removed in this fashion, wipe the lens clean

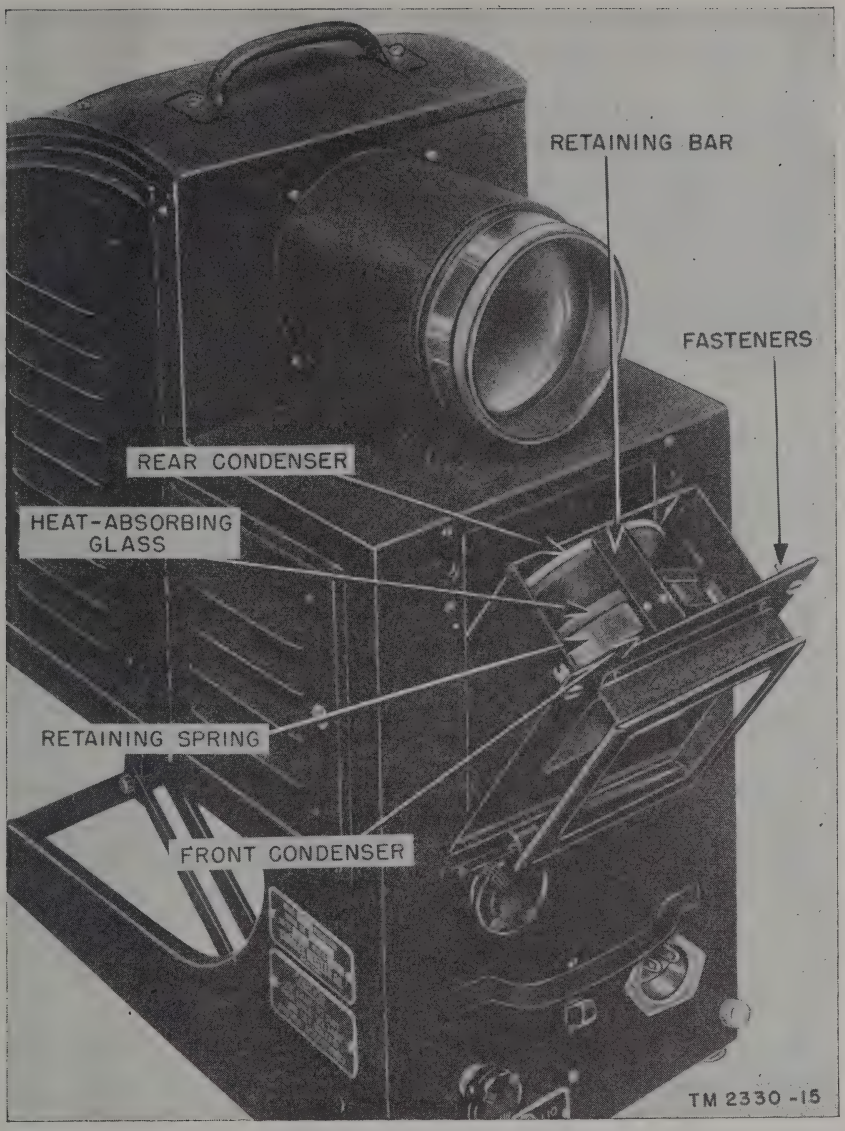


*Figure 15. Condenser compartment open for removal of condensers and heat absorbing glass.*

with lens tissue. *Do not attempt to take the lenses apart. It is only necessary to clean the external surfaces of the lens.*

## 33. Cleaning Condensers and Heat-Absorbing Glass (fig. 15)

Remove the slide projection cone or the film strip attachment, if either is in place. Loosen the two fasteners at the top of the condenser box by giving them a one-fourth turn clockwise. This will

permit the condenser compartment to swing forward. Remove the condenser retaining clip by holding the retaining bar with one hand and pushing the condenser retaining spring down with the other hand until the bent ends are free of the retaining ears. The clip can then be removed. Slide the condensers up and out of the condenser box. Clean the condensers by removing all dust and grit with a camel's-hair brush or by blowing air across the condenser with a syringe bulb. Wipe the surfaces with lens tissue. The heat-absorbing glass is cleaned in the same way. In cleaning the condensers remove one, clean it, and replace it prior to the removal of the other, so that the condensers are replaced in their proper position. The thicker condenser is placed nearer the lamp.

## 34. Cleaning First-Surface Mirror (fig. 18)

***Caution:*** The reflecting coating of this mirror is deposited on the front surface and is not protected by glass as with ordinary mirrors. This surface is extremely delicate. Do not rub it or get finger marks on it. To clean the first-surface mirror, blow the dust off with a bulb syringe. If additional cleaning is necessary, wipe gently with a soft lint-free cloth. If the mirror is exceptionally dirty, clean it with a soft lint-free cloth moistened with alcohol or ether. *Never use water on this mirror.*

## 35. Cleaning Secondary Mirrors (fig. 8)

There are two side secondary mirrors and one rear secondary mirror. These are rear surface mirrors and can be cleaned by wiping them with a water-dampened, lint-free cloth, or with lens tissue.

## 36. Cleaning Parabolic Reflector (fig. 8)

To remove the lamp, give it a one-fourth turn counterclockwise and then withdraw it from the lampholder. The parabolic mirror is a rear surface mirror and can be cleaned by wiping it with a water-dampened, lint-free cloth or with lens tissue. *It is not necessary to remove the reflector from the projector in order to clean it.*

## 37. Cleaning Lamp

Remove the lamp as described in paragraph 36 and clean it with a water-dampened, lint-free cloth or lens tissue. Examine the lamp for blisters in the glass and for a sagging filament. Replace with new lamp, if necessary.

## 38. Cleaning Film Strip Condenser

Depress the latch and lift the cover of the film strip attachment to the position shown in figure 16. Slide the condenser out of its mounting channels. Clean the condenser by removing all dust and grit with a camel's-hair brush or by blowing air across the condenser with a syringe bulb. Wipe the surfaces with lens tissue. Replace the condenser with the curved surface toward the lamp.

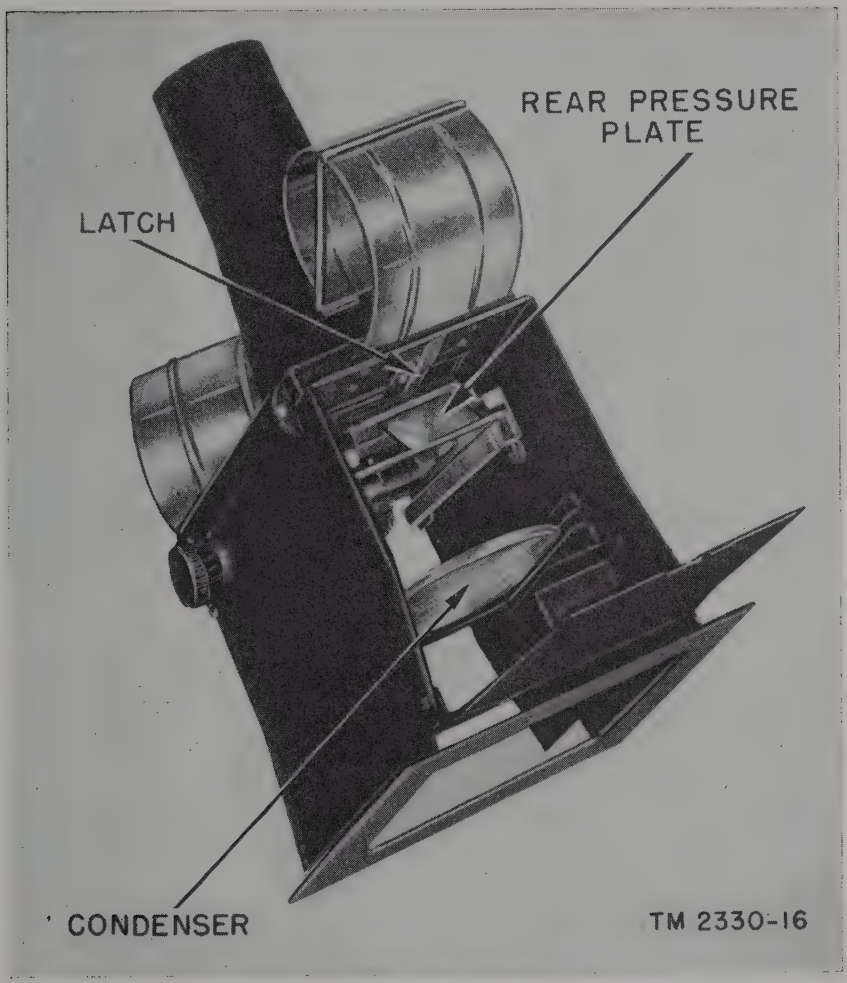


*Figure 16. Film strip attachment, with cover open.*

## 39. Cleaning Rear Pressure Glass (fig. 16)

Open the cover of the film attachment as described in paragraph 38. Grasp the tab on the top of the rear pressure glass (window)

mounting plate. The plate is held forward by two springs so that the top edges of the mounting plate are beneath two bent ears. Move the plate slightly to the rear and draw the pressure plate up and out of the attachment. Clean the pressure glass in the same manner as the condenser (par. 38). To replace the pressure glass, slide it into the grooves until it snaps into place.

## 40. Cleaning Front Pressure Glass (fig. 4)

Open the film gate by releasing the latch. Grasp the top and bottom horizontal edges of the plate on which the pressure glass is mounted. Draw the bottom edge away from the gate. This raises the pressure plate (window) above the retaining strip and permits it to be moved downward and removed. Clean the pressure glass in the same manner as the condenser (par. 38). Replace the pressure plate (window) following the reverse procedure.

## 41. Preventive Maintenance Checklist

The following checklist is a summary of the organizational PM schedule for maintaining Projection Equipment PH–132–C in optimum operating condition. The suggested time intervals for performing the PM operations as shown on the checklist may be varied at any time by the local commander. For best performance of the equipment, however, it is recommended that the operations be performed at least as frequently as called for in the checklist.

| Item No. | Item to be inspected and cleaned | Instruction paragraph | When performed | | |
|---|---|---|---|---|---|
| | | | Before operation | Only when absolutely necessary | Maintenance performed by |
| 1 | Lens, 18″ f/lg | 32 | X | | O |
| 2 | Lens, 10″ f/lg | 32 | X | | O |
| 3 | Lens, 4″ f/lg | 32 | X | | O |
| 4 | Condensers | 33 | X | | O |
| 5 | Heat-absorbing glass | 33 | X | | O |
| 6 | First-surface mirror | 34 | | X | O |
| 7 | Secondary mirrors | 35 | X | | O |
| 8 | Parabolic reflector | 36 | X | | O |
| 9 | Lamp | 37 | X | | O |
| 10 | Film strip condenser | 38 | X | | O |
| 11 | Rear pressure glass | 39 | X | | O |
| 12 | Front pressure glass | 40 | X | | O |

NOTE. X indicates when operations are to be performed; O indicates operator.

## Section VII. LUBRICATION

(Not required.)

## Section VIII. WEATHERPROOFING

### 42. General

Signal Corps equipment, when operated under the severe climatic conditions which prevail in the tropical, Arctic, or desert regions, requires special treatment and maintenance.

### 43. Tropicalization

*a.* GENERAL. Because fungus growth, insects, corrosion, salt spray, and excessive moisture affect most materials harmfully, a special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. Refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment. The following problems may be encountered:

(1) Resistors fail because of the effects of fungus growth and excessive moisture.

(2) Electrolytic action, often visible in the form of corrosion, takes place in resistors causing eventual break-down.

(3) Hook-up wire insulation and cable insulation break down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical paths on insulating strips, causing flash-overs.

***Caution:*** Varnish spray may have poisonous effects if inhaled. To avoid inhaling spray, use a respirator if available; otherwise fasten cheesecloth or other cloth material over nose and mouth. Never spray varnish or lacquer near an open flame. Do not smoke in a room where varnish or lacquer is being sprayed. The spray may be highly inflammable.

*b.* PROJECTION EQUIPMENT PH–132–C. Projection Equipment PH–132–C is treated for moistureproofing and fungiproofing during manufacturing. No further treatment is necessary unless the coating has been damaged.

*c.* MOISTUREPROOFING AND FUNGIPROOFING AFTER REPAIRS. If the coating of protective varnish has been punctured or broken

during repair and if a complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

## 44. Winterization

*a.* GENERAL. Special precautions are necessary to prevent poor performance or total operational failure of equipment in subzero temperatures. Most signal equipment can be used in winter if difficulties common in low temperatures are anticipated and precautions taken to prevent them. For operation purposes, place equipment in heated rooms whenever possible. Wrap it in blankets when on the march to protect it from winds and freezing temperatures. Refer to TB SIG 66, Winter Maintenance of Signal Equipment, for complete information. The following problems may be encountered:

(1) *Steel.* Steel shrinks and becomes brittle in subzero temperatures.

(2) *Glass.* Glass is especially susceptible to sudden temperature changes. The difference between a low air temperature and the warmth of a man's breath may be sufficient to shatter a lens.

(3) *Rubber.* Natural rubber resists cold weather well, but certain types of synthetic rubber are unreliable and become brittle.

*b.* PROJECTION EQUIPMENT PH–132–C. When the equipment has been stored outdoors or in an unheated shelter where extreme cold temperatures are encountered, the following procedure is recommended before attempting to operate the equipment:

(1) Transfer the equipment from the cold to the warmer temperature, and allow it to remain in the room temperature for approximately 6 hours before removing the equipment from the case.

(2) Do not open the carrying case before the equipment has reached the room temperature, because water may condense on the equipment and cause permanent damage to it. Whenever possible, inclose the equipment in a water repellent material such as waterproof bags, shelter cloth, or other improvised coverings while the equipment is in the cold atmosphere, and then transfer it to the warmer room. The water repellent material must inclose the equipment as airtight as possible. Keep this covering on until the equipment has reached the room temperature. This procedure will eliminate further the possibility of water's condensing on the equipment.

(3) Before operating the equipment, clean and dry any water

that has condensed on the pressure gate glasses, sprockets, parabolic reflector, and the reflecting mirrors inside the housing. Use a lint-free cloth for this operation. Clean the projection lenses and condensing lenses with lens tissue. When moisture has condensed on the inside surfaces of the projection lenses, it is necessary to leave the lamp turned on until the moisture evaporates from the surfaces of the lenses before operating the projector.

## 45. Dustproofing

*a.* GENERAL. Signal Corps equipment operated in desert localities is affected by the extremely high temperatures and the amount of dirt, dust, sand, and other foreign matter in the air. Be careful to prevent such substances from filtering into the equipment. Cover the equipment when it is not in use. Thorough cleanliness is imperative. If possible, inspect and clean the equipment daily. Foreign matter, such as dirt, dust, and sand, acts as an abrasive causing excessive wear. Refer to TB SIG 75, Desert Maintenance of Ground Signal Equipment.

*b.* PROJECTION EQUIPMENT PH–132–C. Dustproofing of the equipment is necessary only under adverse conditions of operation. When the equipment is operated outdoors where wind, dust, or sand are present, expose the equipment as little as possible. Before storing the equipment, remove with a camel's-hair brush all sand or other foreign matter on the pressure glasses, sprockets, reflectors, and projection lenses. Do not use lens tissue before cleaning the optical lenses with a camel's-hair brush. Do this cleaning indoors or under cover to insure that no dust remains on the equipment when stored. Avoid storing the projector outdoors. When it is found necessary to store the equipment outdoors, cover it with shelter cloth or other improvised material to protect it from dust.

# PART FOUR

# AUXILIARY EQUIPMENT

(Not used.)

# PART FIVE

# REPAIR INSTRUCTIONS

## Section IX.—THEORY OF EQUIPMENT

### 46. General

Projection Equipment PH–132–C projects the images of transparencies (slides or film strips) and of opaque copy or objects. Light radiates in all directions from a projection lamp mounted on a swivel base. In order that this light may be guided in one direction, a parabolic reflector is mounted directly behind the lamp to reflect the light from that side of the lamp. In the projection of slides or film strips, the light is directed through the condenser lenses and then through the slide or film strip and the projection lens in approximately a direct path to the projection screen. In the projection of opaque material, the light brilliantly illuminates the copy and the light reflected from the copy is directed by a first-surface mirror to the projection lens, which produces the image on the screen. The size of the image for each of the projection lenses is proportional to the distance between the projector and the screen. Appendix I contains data showing the size of the screen image for each type of projection at various projection distances. The intensity of illumination on the projection screen varies inversely with the area of the screen image. The larger the screen image, the lower the intensity of illumination for each type of projection.

### 47. Projection of Images from Slides and Film Strips

Figure 12 shows the position of the lamp for the projection of slides and film strips. The light directed toward the screen is intercepted by the first condenser and concentrated. It then passes through a heat-absorbing glass which filters out a considerable part of the red or hot portion of the spectrum. The light then continues through the second condenser, which converges it through the slide or film strip to the projection lens. The projection lens then produces the image on the screen.

## 48. Projection of Images from Opaque Material

Figure 8 shows the lamp in the proper position for the projection of opaque copy or objects. The light is directed toward the copy. Secondary mirrors on each side and at the rear of the copy pick up additional light and reflect it toward the copy. Above the opaque copy opening and adjusted at the proper angle is a first-surface mirror. The reflected light from the surface of the opaque copy or object is directed by this mirror to the lens, which projects the image onto the screen.

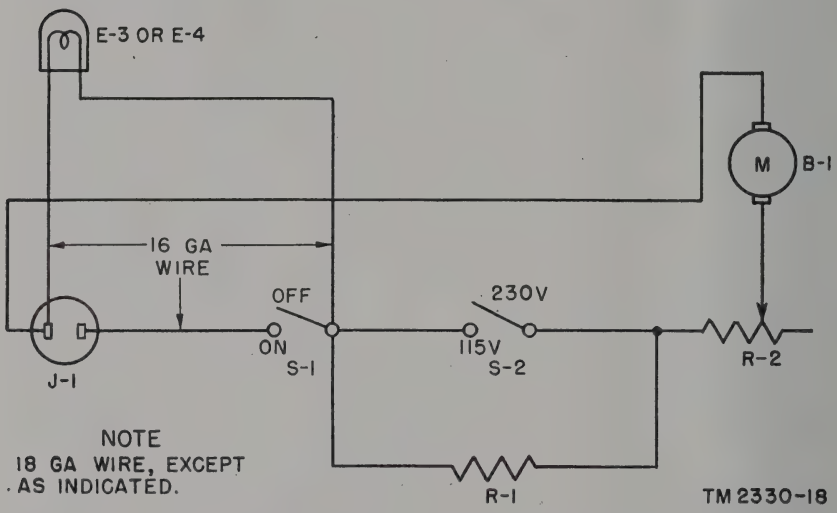


*Figure 17. Electrical system, schematic diagram.*

## 49. Cooling System

The blower motor is designed to operate on 115 volts, ac or dc. The electrical system of the projector (fig. 17) includes a power resistor which can be switched into or out of the motor circuit by the voltage selector switch (fig. 3). When this resistance is switched in, it is in series with the motor and the equipment can be operated on 230 volts, ac or dc. The motor circuit also includes a rheostat for controlling the speed of the motor. The blower is designed to move cool air, taken from outside the projector, across the opaque copy. The air continues forward to cool the lamp and other parts of the projector and escapes by passing through the louvered openings in the projector housing. These openings are shielded so that no direct light can escape.

## Section X. TROUBLE SHOOTING

### 50. Trouble Chart

| Trouble | Probable cause | Remedy |
|---|---|---|
| Lamp does not light | Main switch or wiring defective. | Replace switch or wiring. |
| | Lamp burned out | Replace lamp. |
| Motor does not operate with voltage switch in either position. | Motor brushes worn | Replace brushes. |
| | Rheostat burned out | Replace rheostat. |
| | Voltage selector switch or wiring defective. | Replace switch or wiring. |
| Motor does not operate with voltage switch set for 230v, but does operate when switch is set for 115v. | Fixed resistor burned out. | Replace fixed resistor. *Note.* Use 115v in testing for this trouble. |
| Motor races when used on 230v with voltage selector switch in proper position. | Voltage selector switch or wiring defective. | Replace switch or wiring. |
| Motor not fast enough when used on 115v with voltage selector switch in proper position. | Voltage selector switch or wiring defective. | Replace switch or wiring. |
| Motor and lamp do not operate. | Main switch or power connector broken. | Repair or replace main switch or power connector. |
| Scratches or lines on screen when projecting film strip. | Pressure glasses cracked or scratched. | Replace pressure glasses. |
| | Film scratched | Replace film. |
| Pictures do not advance properly when projecting film strip. | Perforations broken | Replace film. |
| | Clutch knob loose | Tighten clutch knob. |

## Section XI. REPAIR

### 51. Tools Required

No special service tools are required for repair of this equipment. The repairman should have an assortment of screw drivers, pliers, crocus cloth, #00000 sandpaper, small files, and a soldering iron of 100- to 150-watt capacity.

### 52. Replacing Parabolic Reflector (fig. 18)

Turn the swivel actuating knob (fig. 3) until the reflector is approximately in the position shown in figure 18. Remove the nuts on one end of each reflector clamping strip. Do not remove the

strips. Turn the swivel actuating knob clockwise, as far as it will go. Remove the lamp. Remove the reflector by sliding it up and out of the mounting channels. Insert a new reflector into the mounting channels with the cut-out portion toward the bottom. Replace the nuts on the reflector clamping strips and tighten them securely.

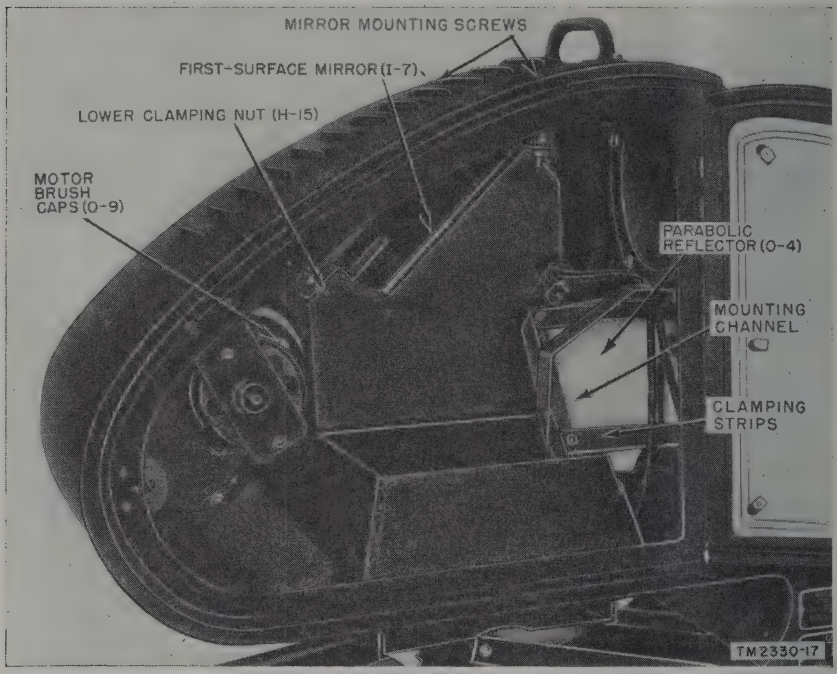


*Figure 18. Interior of projector.*

## 53. Replacing First-Surface Mirror (fig. 18)

Remove the lower clamping nut and washer which supports the adjusting bracket. Remove the mirror mounting screws, taking care not to lose the nuts and lockwashers for these screws. The entire mirror assembly now can be removed from the projector. Then remove the mirror retaining screw and slide the mirror up and out of the channels. Insert a new mirror. Be sure that the brighter reflecting surface faces outward. Replace the reflector retaining screw. Replace the mirror mounting screws. Replace the lower mirror clamping nut and washers. Make sure all mounting nuts and bolts are tight.

***Caution:*** A first-surface mirror is one which has the reflecting surface deposited on the front surface of the mirror rather than

on the back as is the case with ordinary mirrors. This surface is delicate and should never be touched with the fingers.

### 54. Replacing Side Secondary Mirrors

Straighten the retaining ear (fig. 8). Slide the mirror out toward the front of the projector. Slide the new mirror in place. Bend the retaining ear inward with the fingers.

### 55. Replacing Rear Secondary Mirror (fig. 8)

Remove both side secondary mirrors (par. 54). Remove the fiber cushions behind the side secondary mirrors. Remove the rear mirror by swinging the lower edge forward. Insert a new mirror. Replace the fiber cushions and side secondary mirrors.

### 56. Replacing Front Pressure Plate (Window) in Film Strip Attachment (fig. 4)

Remove the pressure plate as described in paragraph 40. Insert the new pressure plate (window), following the reverse procedure.

### 57. Replacing Rear Pressure Plate (fig. 16)

Remove the rear pressure plate as described in paragraph 39. Insert the new pressure plate, following the reverse procedure. When the pressure plate has been inserted as far as it will go, it will spring forward. Turn the film feed knob until the cam clicks. Snap the cover shut.

### 58. Replacing Motor Brushes (fig. 18)

Unscrew the Bakelite brush caps. Depress the brush retaining clip and withdraw the spring; the brush will come out with the spring. Replace the worn brush with a new one. Replace the brush caps.

### 59. Replacing Motor

Open the large door of the projector. Disconnect the two motor leads. Remove the two screws which hold the motor mounting bracket to the side of the projector. Remove the four screws which support the blower casting (three screws are located around the blower intake on the left side of the projector and one screw is located below the louver at the top of the projector). The entire motor and blower assembly now can be removed from the projec-

tor. Detach the motor from the blower housing by removing the four screws which fasten the motor mounting bracket. Remove the blower wheel from the motor shaft by loosening its setscrew and sliding the wheel off the shaft. Remove the blower mounting plate by unscrewing the two mounting nuts. Replace the motor and reassemble the motor and blower assembly, following the reverse procedure.

### 60. Replacing Rheostat

Lay the projector on its left side. Unsolder the rheostat leads by reaching through the bottom of the projector. Remove the rheostat knob from the front of the projector by loosening its setscrew. Remove the mounting nut on the front of the projector and withdraw the rheostat. Replace the rheostat, following the reverse procedure.

### 61. Replacing Lampholder

Open the large door of the projector. Loosen the screw on the lampholder clamping ring (fig. 19). Pull the lampholder up and out of the clamping ring. Remove the insulating plate from the bottom of the lampholder. Disconnect the leads by loosening the contact screws. Replace the lampholder, following the reverse procedure.

### 62. Replacing Pressure Plate Spring of Film Strip Attachment

One end of the pressure plate spring is attached through a hole provided on the front of the film strip attachment. The other end is slipped over a stud located on the yoke legs in the attachment. To remove the spring, first slip the one end from the stud. To replace the spring, insert one end in the hole provided and then slip the other end over the stud and into the grooves provided on the stud.

### 63. Replacing Swivel Actuating Shaft Assembly (fig. 19)

Open the small door on the projector. Loosen the setscrew on each collar located at each end of the shaft. Grasp the swivel actuating knob and withdraw the shaft from the projector. Remove the two collars from the helically wound wire. Remove the helically wound wire from the sheet metal nut. To reassemble the swivel actuating assembly, thread the new helically wound wire through the sheet metal nut. Attach the two collars by inserting each end

of the wire into the hole provided in each collar. Insert the shaft through the front of the projector so that it enters the front collar, the helically wound wire, the sheet metal nut, and the rear collar. Tighten the setscrew on each collar.

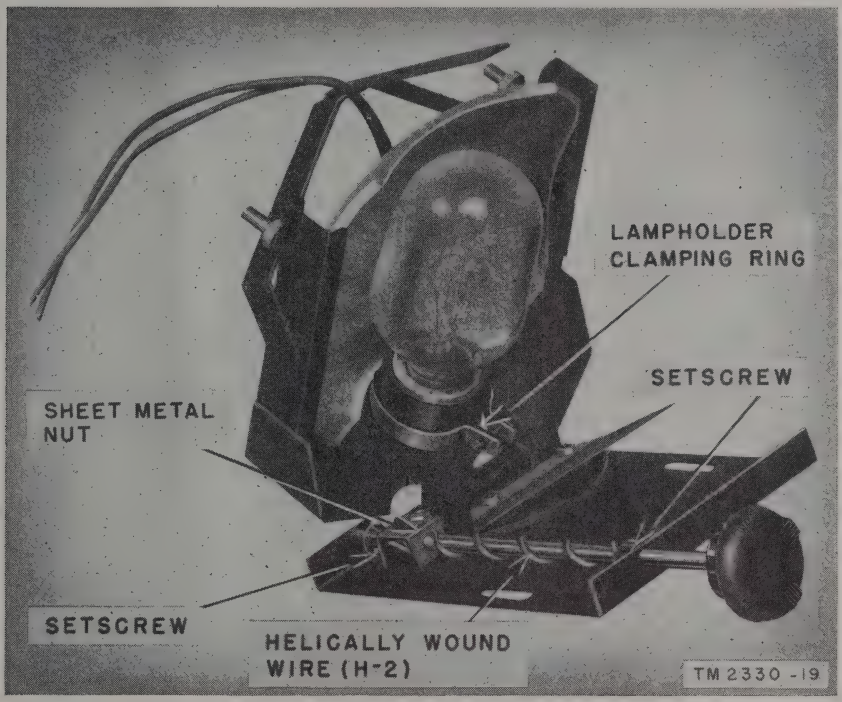


*Figure 19. Lampholder and swivel actuating shaft assembly.*

## 64. Unsatisfactory Equipment Report

*a.* WD AGO Form 468 (Unsatisfactory Equipment Report) for Equipment Used by Army Ground Forces and Technical Services. WD AGO Form 468 will be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C., when trouble occurs more often than is normal, as determined by qualified repair personnel.

*b.* AAF Form 54 (Unsatisfactory Report) for Equipment Used by United States Air Force. AAF Form 54 will be filled out and forwarded to Commanding General, Air Materiel Command, Wright Field, Dayton, Ohio, in accordance with AF Regulation 15–54.

# APPENDIX I

# PROJECTION DATA

| Focal length of lens (in.) | Used to project | Size of mask (in.) | Projection distance (ft) | | | |
|---|---|---|---|---|---|---|
| | | | 15 | 20 | 25 | 30 |
| | | | Size of image on screen (ft) | | | |
| 4 | Film strips | 11/16x15/16 | 2½x3½ | 3½x5 | 4x6 | 5x7½ |
| 10 | Slides | 2¾x3 | 4x4½ | 5½x6 | 6½x7½ | 8x8½ |
| 18 | Opaque material | 6¼x6¼ | 4½x4½ | 6½x6½ | 8x8 | |

# APPENDIX II

# REFERENCES

## 1. Publications

FM 21–6, List and Index of War Department Publications.
TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66, Winter Maintenance of Signal Equipment.
TB SIG 75, Desert Maintenance of Ground Signal Equipment.
TM 38–650, Basic Maintenance Manual.

## 2. Forms

WD AGO Form 468, Unsatisfactory Equipment Report.
AAF Form 54, Unsatisfactory Report.

# APPENDIX III

# IDENTIFICATION TABLE OF REPLACEABLE PARTS

## 1. Supply Pamphlet

The following information was compiled on 31 October 1947. The appropriate pamphlet of the Department of the Army Supply Catalog for Projection Equipment PH–132–C is—

*Organizational Maintenance Allowances and Field and Base Maintenance Stockage Guide*

SIG 7&8–PH–132–C (will be listed in FM 21–6 when published). For an index of available catalog pamphlets, see the latest issue of the Army Supply Catalog SIG 1 and 2.

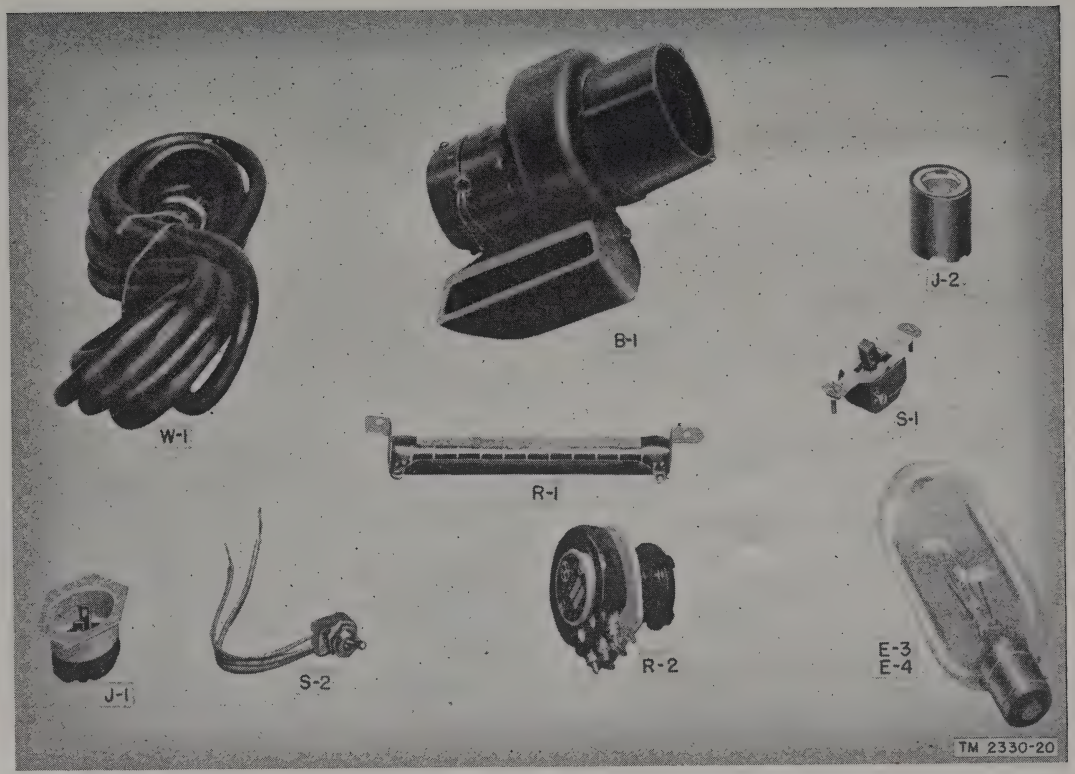


*Figure 20. Projection Equipment PH–132–C, electrical components.*

## 2. Identification Table of Replaceable Parts for Projection Equipment PH-132-C

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| Figs. 1 and 2 | PROJECTION EQUIPMENT PH–132–C: still-picture and opaque objects; 3¼″ x 4″ slides, 6″x6⅜″ opaque material, 35-mm film strip; 115 or 230 v AC, 500 w; incl screen, 3 lenses, slide carrier, 2 card holders, film strip attachment, 2 500-w lamps, 6 pkg lens tissue; portable; fiber carrying case 32″ lg x 15″ wd x 25″ h; Chas Beseler model No. 132. | Projects images onto screen | 8A3122–132C |
| Fig. 16 | ATTACHMENT, film strip: vertical and horizontal type; stainless steel and brass, bright chrome and black crackle finish; 9″ lg x 5″ wd x 9″ h; Chas Beseler part No. 1790. | Provides film movement mechanism. | 8P7–20 |
| | BAG: projection screen; canvas, olive drab; approx 7″ diam x 111″ lg; flap and buckle at one end; no supporting framework; Chas Beseler No. S–1334. | Protects projection screen | 8F235 |
| | BALL, positioning: stainless steel, polished; spherical; 5/32″ diam; Abbot Ball Co No. 5/32 D–18–8. | Engages spiral focusing grooves on lenses. | 8P7–36 |
| Fig. 2 | BRUSH, elec cont: 1–v commutator brush; carbon; rect, ½″ lg x 3/16″ wd x 3/16″ thk; commutator end concave; Pure Carbon No. G–32. | Contacts blower motor armature. | 3H525PC |
| | BUSHING: Dzus fastener; copper nickel; female; 5/16″ OD x 0.263″ ID x ¼″ lg; Dzus No. GA4–250 C/N (req f/studs Dzus No. A4–40 and No. KJ4–40, u/w spring No. S4–200). | Part of large and small door and condenser compartment latches. | 6ZK4920 |
| W–1 | CABLE ASSEMBLY, power: underwriters type S; two #14 AWG stranded cond; 230 v working; 15 ft lg excl term.; Cords, Ltd No. M–4 molded male plug at one end; Cords, Ltd No. MC–4 molded at other end; Cords, Ltd No. MC–MC4. | Connects projector receptacle to power source. | 3E7350.1–180.2 |
| Fig. 18 | CAP: motor brush; black fiber; ⅜″ diam x 11/32″ lg; ⅜″ –24 thd, 3/16″ lg; on circum; Elec Mtr No. 92. | Holds motor brushes in place. | 3H683–57 |

| | | | |
|---|---|---|---|
| Fig. 2 | CARRIER, projector slide: 3¼″ x 4″ slides; complete assem; brass, chrome pl; 12½″ lg x 5″ wd x ½″ thk; Chas Beseler No. S1795. | Holds slides for projection | 8P7–77 |
| Fig. 2 | CASE: projection equip.; vul fiber, olive drab finish; 32″ lg x 15″ wd x 25″ h; incl compartments f/components; one trunk type handle on ea end; separate top and bottom w/6 latches; Chas Beseler No. S1315–S265. | Holds projector and accessories. | 8P7–1650 |
| J–1 | CONNECTOR, receptacle: 2 flat parallel male cont; straight; 1½″ diam x 1¼″ lg; 10 amp 125 v, 5 amp 250 v; cylindrical black phenolic body w/steel flange; Hubbell No. 4891. | Connects projector to cable assembly. | 2Z3022–72 |
| | FASTENER, Dzus: (see STUD, BUSHING, and SPRING). | Latches large and small doors and condenser compartment. | |
| Fig. 4 | FASTENER, spring lock: 35-mm attachment film gate; steel, chrome pl; 1⅞″ lg x ⅜″ wd x 0.022″ thk; Chas Beseler No. S1790–29. | Latch for gate on film strip attachment. | 8P7–113 |
| | FOOT, mounting: brass, chrome pl; approx 1″ diam x 15/16″ lg over-all; No. 6–32 x ¾″ lg thd shaft; Buckeye Glide Co. No. 136 type B– 6/32″ x ¾″. | Provides smooth surface for projector legs. | 8P7–121 |
| Fig. 15 | GLASS: heat-absorbing; 4½″ OD x ¼″ thk; Chas Beseler No. S1315–S103B. | Filters hot rays from light | 8P7–136 |
| Fig. 11 | HOLDER, card: f/3″ x 6″ to 6″ x 6″ cards; steel, black finish; 7⅜″ lg x 6 9/32″ wd x ⅝″ thk; Chas Beseler No. S1315–S229. | Holds cards for projection | 8P7–147 |
| | INSULATOR, bushing: round, flanged; white porcelain; 1″ lg x 13/16″ OD x 15/32″ ID; Fed Elec No. A2 porcelain bushing. | Prevents electrical wires from making contact with projector housing. | 3G1250–6.16 |
| Fig. 4 | KNOB: round; black bakelite; f/No. 10–32 shaft; screw-on type; ¾″ diam x 9/16″ lg; 5/16″ d shaft hole; Kurz-Kasch No. S–73–3. | Knob for film framing clutch | 2Z5822–80 |
| Fig. 3 | KNOB: round; black bakelite; f/¼″ diam shaft; double No. 8–32 setscrew; 1⅛″ diam x ⅝″ lg; 7/16″ d shaft hole; Kurz-Kasch No. S–308–64–BB. | Rheostat control knob | 2Z5748.18 |

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| Fig. 3 | KNOB: round; black Bakelite; f/¼″ diam shaft; double No. 8–32 setscrew; 1⅝″ diam x ⅝″ lg; ½″ d shaft hole; Kurz-Kasch No. S–309–64–BB. | Knob for swivel actuating assembly. | 2Z5822–88 |
| E–3 | LAMP, incandescent: 115 v, 500 w; bulb T–20 clear; approx 5¾″ lg over-all; med prefocus base; C–13 fil; burn base down; Radiant Lamp Corp No. PXBP. | Provides light from 115-volt power source. | 6Z6815–32 |
| E–4 | LAMP, incandescent: 230 v, 500 w; bulb T–20 clear; 5¾″ lg over-all; med prefocus base; CC–13 fil; burn base down; Radiant Lamp Corp No. PXBP–230 v. | Provides light from 230-volt power source. | 6Z6830–500 |
| J–2 | LAMPHOLDER: med prefocus; molded Bakelite body; 110–250 v, 1,000 w; 1¾″ diam x 1⅞″ h; Amphenol No. 98–8, GE No. 296562. | Holds lamp | 8P3–270 |
| Fig. 16 | LENS, condensing: 3″ diam, 9″ f/lg; 3″ diam x ⅜″ thk; clear, colorless, plano-convex; Chas Beseler No. S1790–4. | Part of film strip attachment | 8P7–545 |
| Fig. 15 | LENS, condensing: 4½″ diam, 6½″ f/lg; edged w/aluminum ring; 4½″ diam x 29/32″ thk over-all; clear, colorless, plano-convex; Chas Beseler No. S1315–S102. | Part of projector condenser assembly. | 8P7–555 |
| Fig. 15 | LENS, condensing: 4½″ diam, 7½″ f/lg; edged w/aluminum ring; 4½″ diam x 25/32″ thk over-all; clear, colorless, plano-convex; Chas Beseler No. 1315–S103. | Part of projector condenser assembly. | 8P7–554 |
| Fig. 2 | LENS, projection: still projector, f/35-mm strip film; 4″ or 100-mm f/lg; lens speed f/3.5; 1½″ diam x 2½″ lg; Buhl Optical Co No. S114. | Focuses film strip image on screen. | 8P7–550 |
| Fig. 2 | LENS, projection: still projector f/lantern slides; 10″ or 254-mm f/lg; lens speed f/5.7; 1 5/16″ diam x 3⅜″ lg; Buhl Optical Co No. 123. | Focuses slide image on screen | 8P7–551 |

| | | | |
|---|---|---|---|
| Fig. 2 | LENS, projection: still projector, f/opaque copy; 18″ or 460-mm f/lg; lens speed f/4.5; 4⅛″ diam x 5″ lg; Buhl Optical Co No. S133. | Focuses opaque material image on screen. | 8P7–546 |
| Fig. 18 | MIRROR: glass, 6″ lg x 5″ wd x ¼″ thk; nonmagnifying; front surfaced; Evaporated Metal Film Co No. cr–al–5 x 6 x ¼. | Reflects image of opaque material toward projection lens. | 8P7–225 |
| Fig. 8 | MIRROR: ribbed glass, 8″ lg x 3½″ wd x ⅛″ thk; nonmagnifying; trapezoidal shape; Chas Beseler No. S1315–S188. | Slide secondary mirror reflecting light from lamp toward opaque material. | 8P7–226 |
| Fig. 8 | MIRROR: glass; 8¼″ lg x 2⅞″ wd x ⅛″ thk; nonmagnifying; trapezoidal shape; Chas Beseler No. S1315–S189. | Rear secondary mirror reflecting light from lamp toward opaque material. | 8P7–227 |
| B–1 | MOTOR, AC and DC: series type; 1/80 hp, 6,000 rpm; closed frame; flatted shaft; 2⅞″ diam x 3⅝″ lg over-all, shaft ¼″ diam protruding 1″ from frame; 115 v AC and DC; Elec Mtr No. 67869. | Drives blower for ventilation of projector. | 3H3000–138 |
| Fig. 2 | MOUNTING, lens: aluminum, black anodized, black shrivel finish; 4″ max OD x 11″ lg; slip-in mtg; incl spring and positioning ball f/lens; Chas Beseler No. S–1335. | Lens cone for slide projection | 8P7–848 |
| | NUT, hexagon: steel, cad pl; No. 6–32; 7/64″ thk; 5/16″ wd across flats. | Mounting nut for main switch, receptacle, and first surface mirror bracket. | 6L3606–32.3 |
| | NUT, hexagon: steel, cad pl; No. 8–32; ⅛″ thk; 11/32″ wd across flats. | Mounting nut for opaque copy holder spring. | 6L3608–32.3 |
| | NUT, hexagon: steel, cad pl; No. 10–32; ⅛″ thk; ⅜″ wd across flats. | Mounting nut for projector handle on top of housnig. | 6L3610–323 |
| Fig. 2 | PROJECTOR, still-picture; approx 25″ lg x 12″ wd x 20″ h over-all; 115 v or 230 v 500 w med prefocus lamp; 3 lenses, 4″, 10″, and 18″ f/lg; forced ventilation; variable speed motor-driven blower; hand-operated slide carrier, 2 card holders and 35-mm film strip attachment; stamped steel housing, black crackle finish; Chas Beseler model No. 132 projector, less screen and case. | Projects images from 3¼″ x 4″ slides, 6″ x 6⅜″ opaque copy, and 35-mm film strips. | 8A3122–132C–2 |

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| Fig. 18 | REFLECTOR, light; parabolic; glass, mottled surface; 6″ lg x 6″ wd x 1⅝″ h; Chas Beseler No. S1315–S147. | Reflects light from lamp toward slide, film strip, or opaque material. | 8P7–271 |
| R–1 | RESISTOR, fixed: wire-wound; 200 ohms ± 5%; 78 w; max body dimen 1 5/16″ diam x 6 1/16″ lg; JAN type RW43G201. | Series resistance for 230-volt operation of blower motor. | 3RW20107 |
| R–2 | RESISTOR, variable: wire-wound; 150 ohms ± 10%; 50 w; max body dimen 2.41″ diam x 1.44″ d; open case; linear; JAN type RP152FK151KK. | Controls speed of blower motor. | 3RP–5706 |
| Fig. 2 | SCREEN, projection: portable; 102″ x 102″; vinyl coated cotton fabric; solid semidiffused reflecting surface; mtd on roller 105″ lg; canvas carrying bag approx 7″ diam x 111″ lg; Radiant Mfg part No. EC 102X102 screen, dwg No. A4050E. | Reflects image projected from projector. | 8F7700 |
| | SCREW, machine: fil H; steel, cad pl; No. 6–32; ¼″ lg; fully thd. | Mounting screw for main switch, receptacle, and first surface mirror bracket. | 6L6632–4.12S |
| | SCREW, machine: fil H; steel, cad pl; No. 10–32; ⅜″ lg; fully thd. | Mounting screw for projector handle on top of housing. | 6L7032–6.12S |
| | SCREW, machine: hex. hd; stainless steel; No. 8–32; 7/16″ lg; thd 19/64″ lg; hd ⅜″ across flats x 5/32″ thk; shoulder 7/32″ diam x 9/64″ lg; Chas Beseler part/dwg No. S1315–S201. | Opaque copy holder yoke screw. | 6L20908–7.81SS |
| | SCREW, machine; RH; steel, cad pl; No. 8–32; ½″ lg; fully thd. | Mounting screw for opaque copy holder spring. | 6L6832–8.49S |
| Fig. 3 | SCREW, thumb: knurled thumb hd; brass, nickel pl; No. 12–24; 17/32″ lg fully thd; oval point; hd ⅝″ diam x ¼″ thk; Chas Beseler No. 1315–S20. | Clamps elevating legs | 6L17012–8.5 |
| Fig. 19 | SHAFT: lead screw; complete assem, incl shaft, wire nut, and 2 collars; stainless steel; ½″ diam x 9 5/16″ lg; Chas Beseler No. 1315–S1331. | Operates swivel mounting of lamp. | 8P7–364 |

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|---|---|---|---|
| | SPRING: loop type; Dzus fastener; 0.062″ diam music wire, cadmium pl; approx 1⅛″ lg x ⅝″ wd x 0.200″ h over-all; **S** shape; Dzus No. S4–200 (u/w studs Dzus No. A4–40 and No. KJ–40 and bushng No. GA4–250 C/N). | Part of small and large door and condenser compartment latches. | 2ZK4318–4 |
| | SPRING; helical compression-extension type; motor brush; 0.014″ diam bronze wire; 0.175″ diam x 1⅜″ lg; approx 23 turns; flat ends; Chas Beseler No. S1315–S59B. | Holds motor brush against commutator. | 8P7–909 |
| | SPRING: helical compression-extension type; 0.022″ diam music wire; 9/64″ OD x 29/32″ lg; approx 31 turns; parallel hook term.; Chas Beseler No. S1315–S204. | Holds opaque copy holder latch in locking position. | 8P7–919 |
| | SPRING: helical compression-extension type; 0.035″ diam music wire; 0.210″ diam x 11/16″ lg; 9 turns; hook term. indexed 90°; Chas Beseler No. 1790–20. | Holds rear pressure plate in place in film strip attachment. | 8P7–924 |
| | SPRING: helical compression-extension type; 0.073″ diam music wire; ½″ OD x 2½″ lg; 25 turns; one end hooked, other end tapers to 3/16″ diam; Chas Beseler No. S1315–S197. | Holds opaque copy holder in closed position. | 8P7–918 |
| | STUD: Dzus fastener; steel, cadmium pl; ¼″ diam x ½″ lg; slotted hd 7/16″ diam; Dzus No. A4–UO (req bushing Dzus No. GA4–250 C/N, u/w spring Dzus No. S4–200). | Part of latches for small door and condenser compartment. | 6Z3809–18 |
| | STUD: Dzus fastener; steel, cadmium pl; ¼″ diam x 7/16″ lg body, hd ⅝″ diam x ½″ lg; knurled hd; Dzus No. KJ4–40 (req bushing Dzus No. GA4–250 C/N, u/w spring Dzus No. S4–200). | Part of latch for large door | 6L3809–26 |
| S–2 | SWITCH, toggle: SPST; 5 amp 125 v, 2 amp 250 v; phenolic body; max body dimen 1 9/32″ lg x 23/32″ wd x 31/32″ d; 11/16″ lg bat type handle; JAN type ST12A. | Voltage selector switch | 3Z9863–12A |
| S–1 | SWITCH, toggle: SPST; 10 amp 125 v, 5 amp 250 v; 2½″ lg x 1¼″ wd x 1″ thk; handle ⅝″ lg x 5/16″ sq; GE No. GE2841. | Main power switch | 3Z9862–2.11 |
| | WASHER, lock: steel, cadmium pl; f/ No. 6 screw; round; 0.237″ OD x 0.147″ ID x 0.0312″ thk; split ring type. | Mounting washer for main switch, receptable, and first surface mirror bracket. | 6L70006C–1 |

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| | WASHER, lock: steel, cadmium pl; f/ No. 10 screw; round; 13/32″ OD x 0.200″ ID x 1/16″ thk; split ring type. | Mounting washer for projector carrying handle on top of housing. | 6L70010–2C |
| Fig. 4 | WINDOW: front pressure plate; glass and steel; 2″ lg x 1 9/16″ wd x ⅛″ thk; Chas Beseler No. S1792. | Holds film strip in projection plane. | 8P7–971 |
| Fig. 16 | WINDOW: rear pressure plate; glass and steel; 2″ lg x 1 9/16″ wd x ⅛″ thk; Chas Beseler No. S1791. | Holds film strip in projection plane. | 8P7–970 |

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